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**Kim**

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(54) **LIGHT EMITTING DEVICE PACKAGE AND LIGHT UNIT HAVING THE SAME**

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| | |
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| *H01L 33/48* | (2010.01) |
| *H01L 33/62* | (2010.01) |
| *G02F 1/1335* | (2006.01) |
| *H01L 33/50* | (2010.01) |
| *H01L 33/64* | (2010.01) |

(52) **U.S. Cl.**
CPC ............... ***H01L 33/54*** (2013.01); *H01L 33/486* (2013.01); *H01L 33/62* (2013.01); *H01L 2224/48227* (2013.01); *G02F 1/133603* (2013.01); *H01L 33/505* (2013.01); ***H01L 33/507*** (2013.01); *H01L 33/64* (2013.01)

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USPC ............................................ 362/84, 230–235
See application file for complete search history.

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*Assistant Examiner* — Jessica M Apenteng
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(57) **ABSTRACT**

Disclosed are a light emitting device package and a light unit having the same. The light emitting device package includes a ceramic substrate; a light emitting device on the ceramic substrate; a first light-transmissive resin layer on the ceramic substrate to cover the light emitting device; and a phosphor layer on the first light-transmissive resin layer.

**20 Claims, 12 Drawing Sheets**

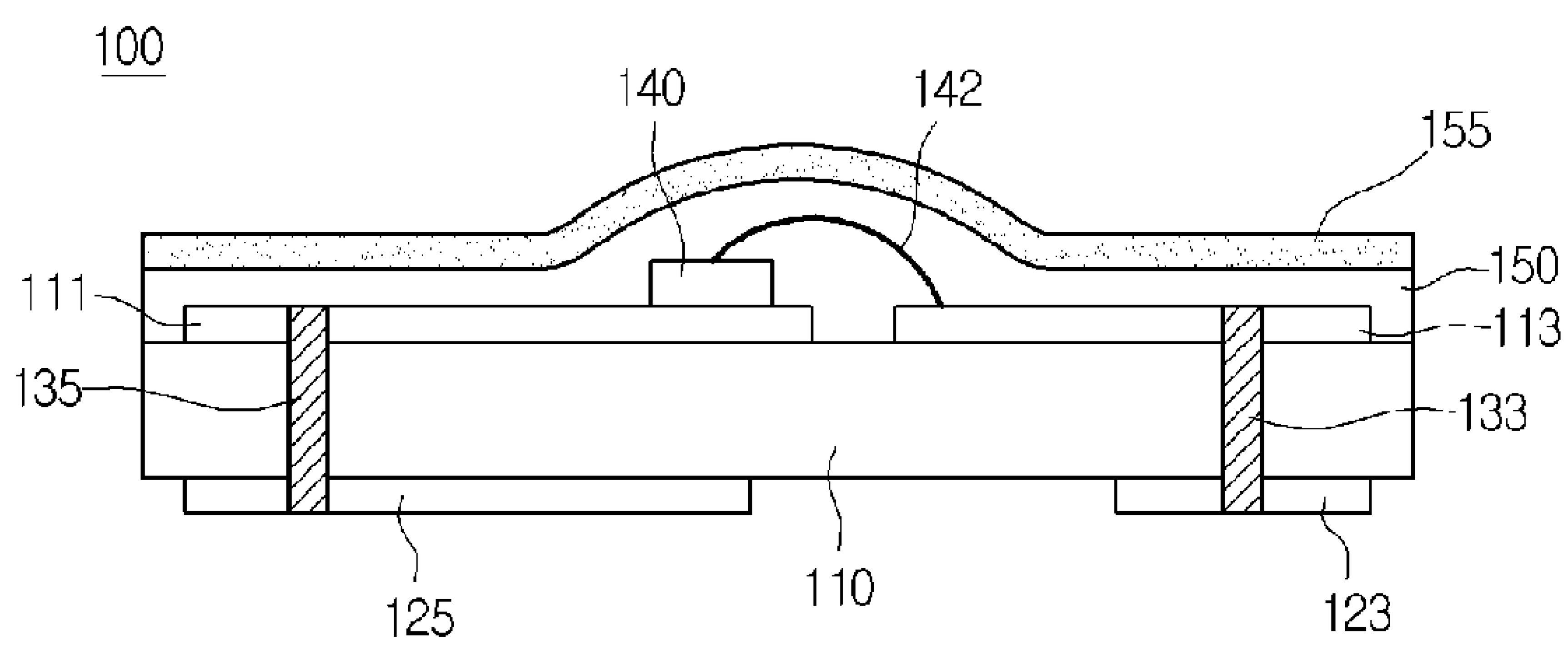

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FIG.1

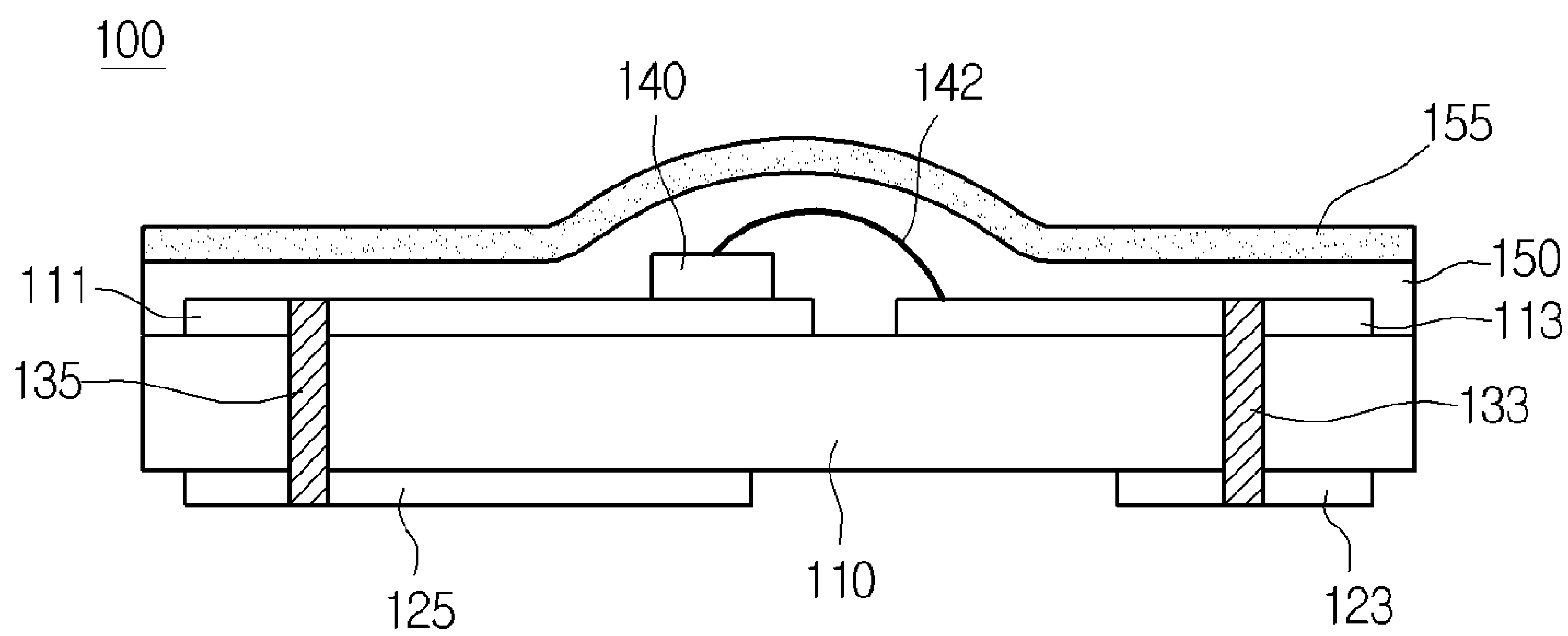

100
140
142
155
150
111
113
135
133
125
110
123

FIG.2

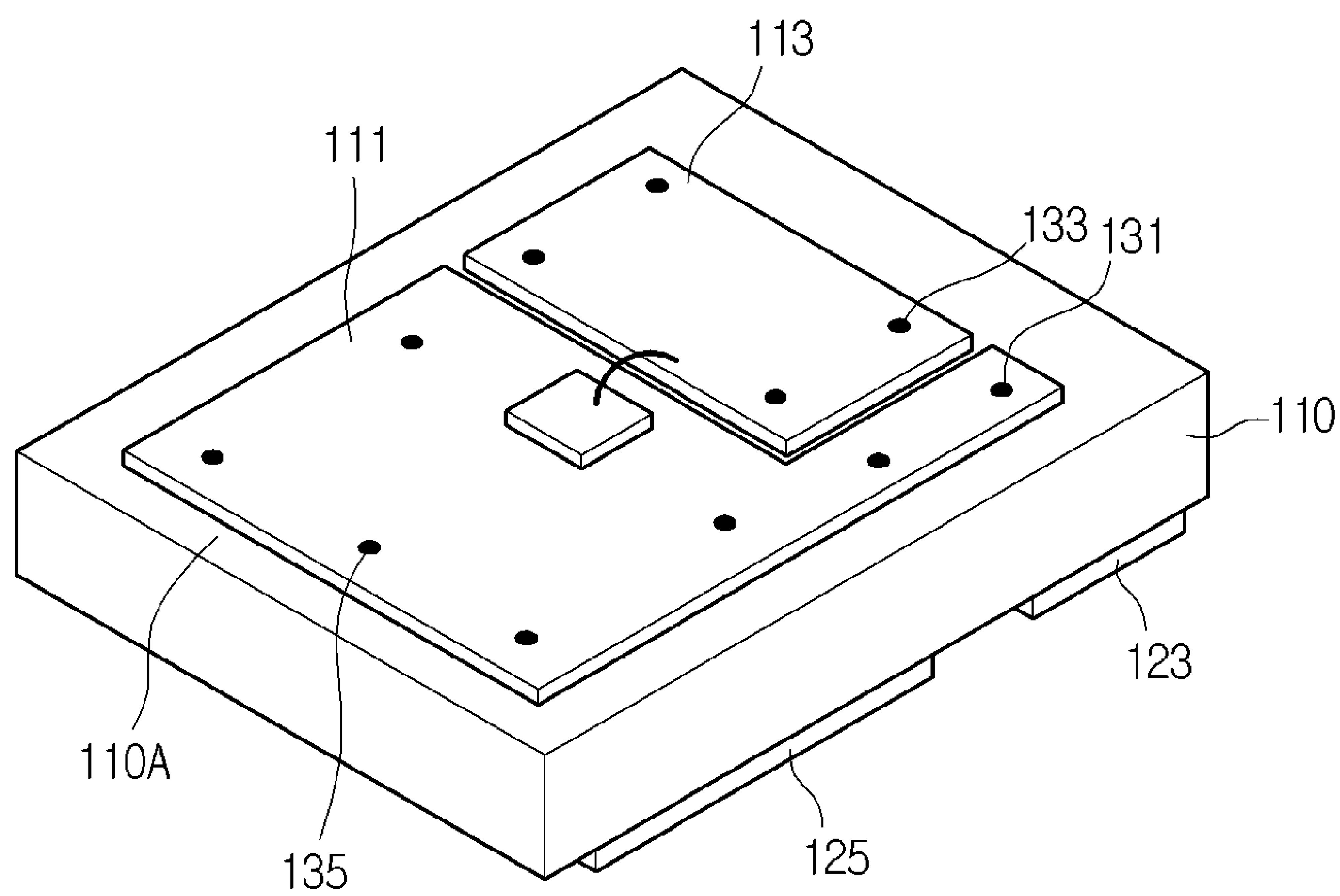

113
111
133
131
110
123
110A
135
125

FIG.3

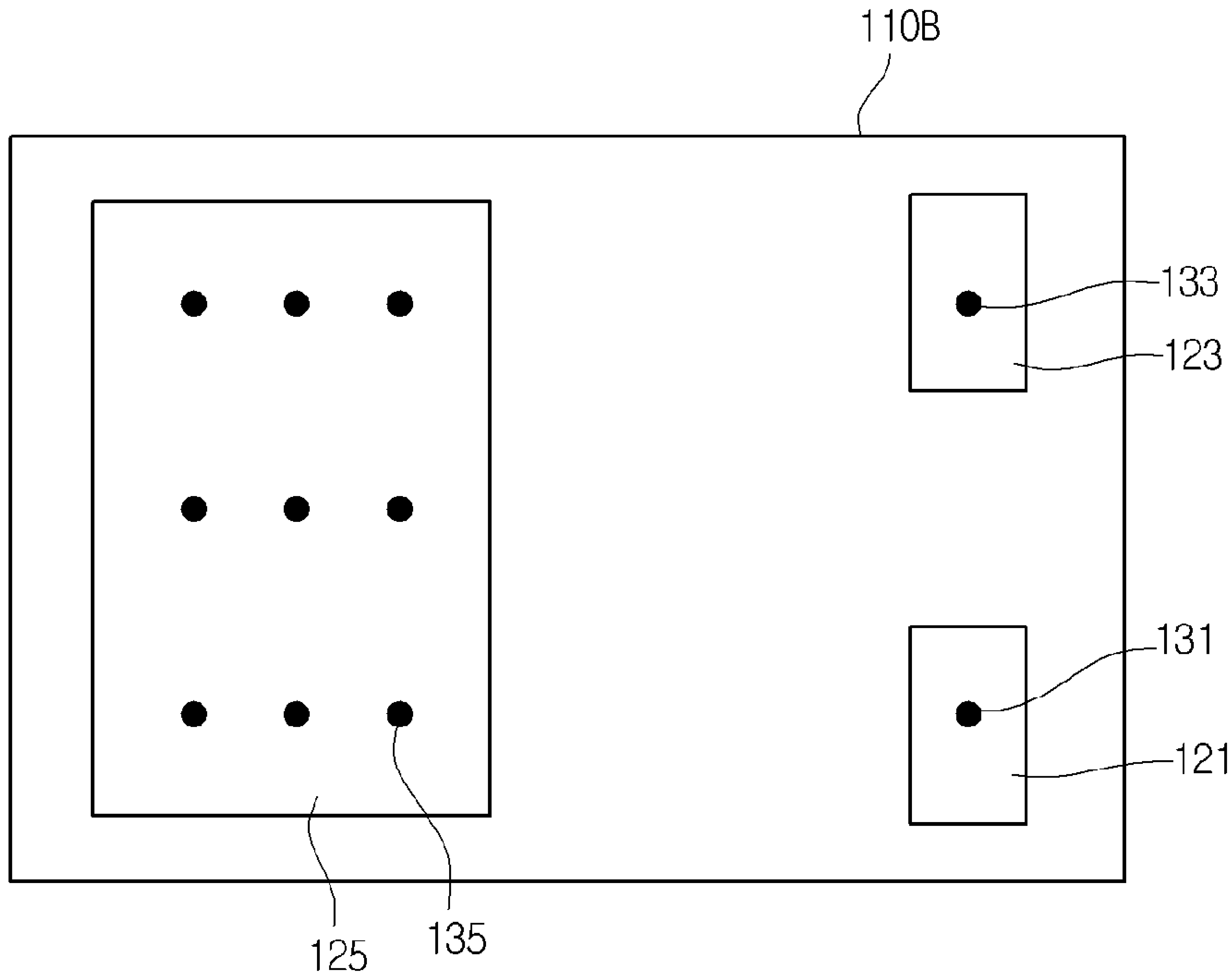

110B
133
123
131
121
125
135

FIG.4

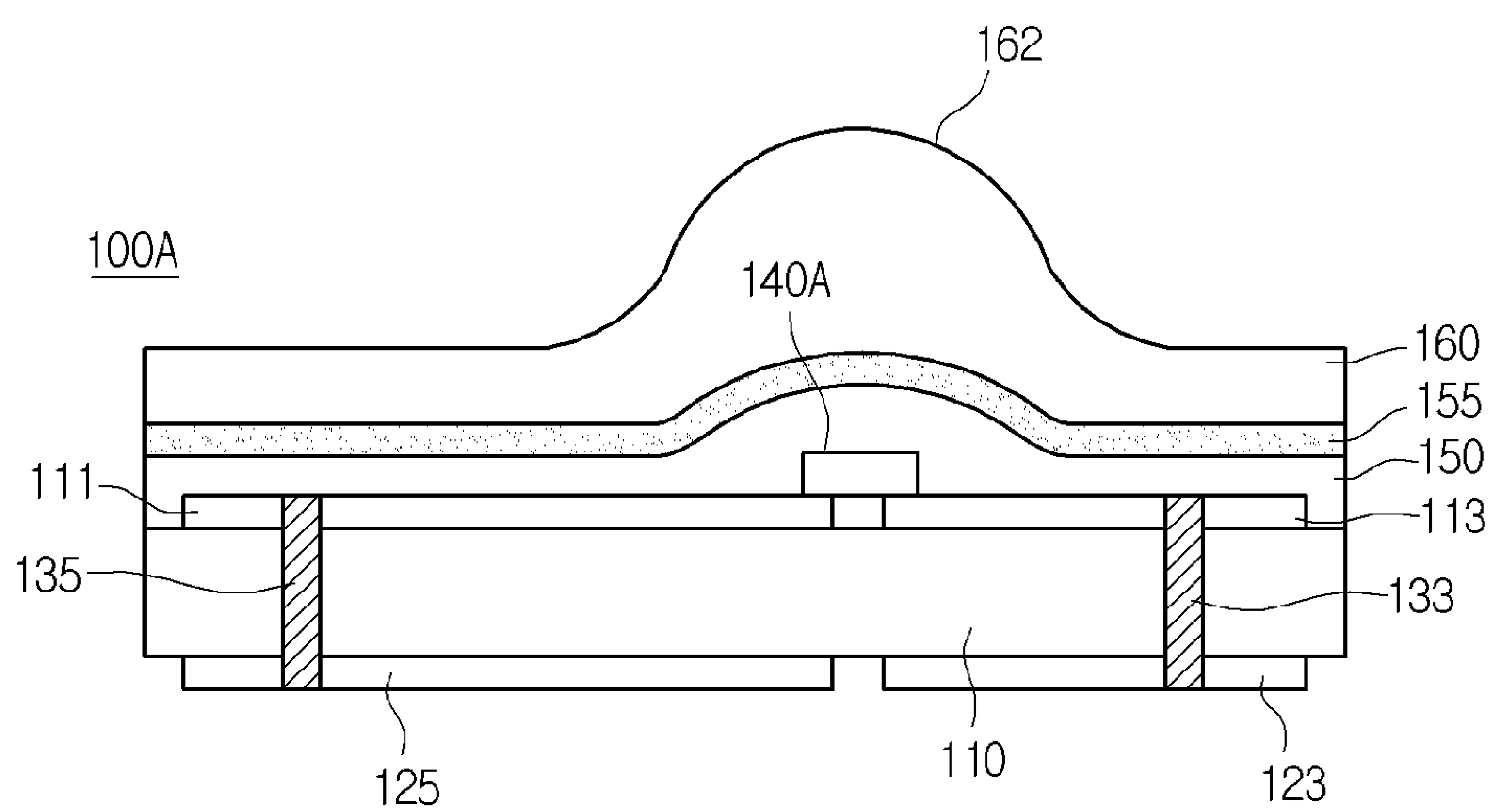
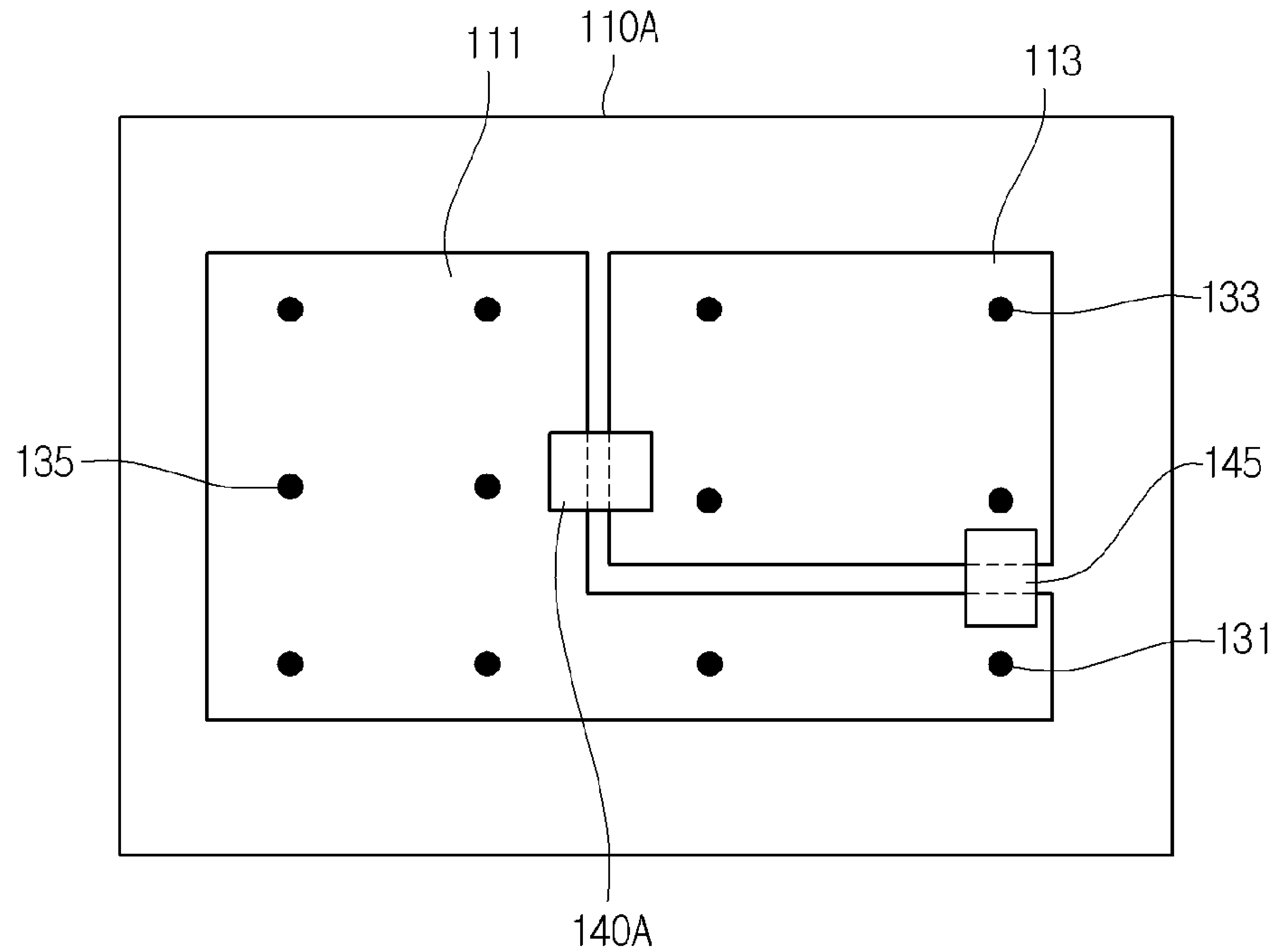
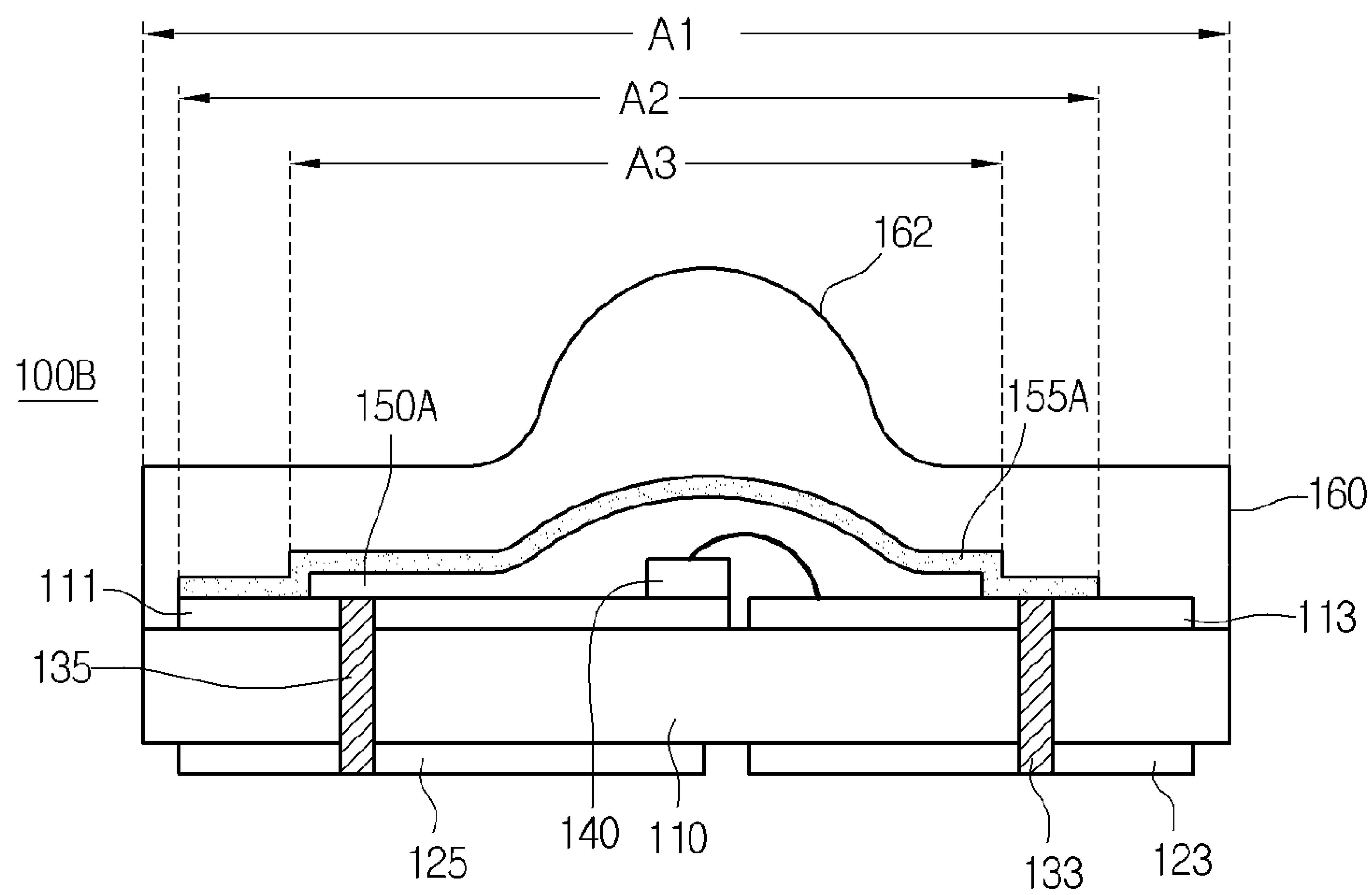

162
100A
140A
160
155
150
111
113
135
133
125
110
123

FIG.5



111
110A
113
133
135
145
131
140A


FIG.6



A1
A2
A3
162
100B
150A
155A
160
111
113
135
140
110
125
133
123

FIG.7

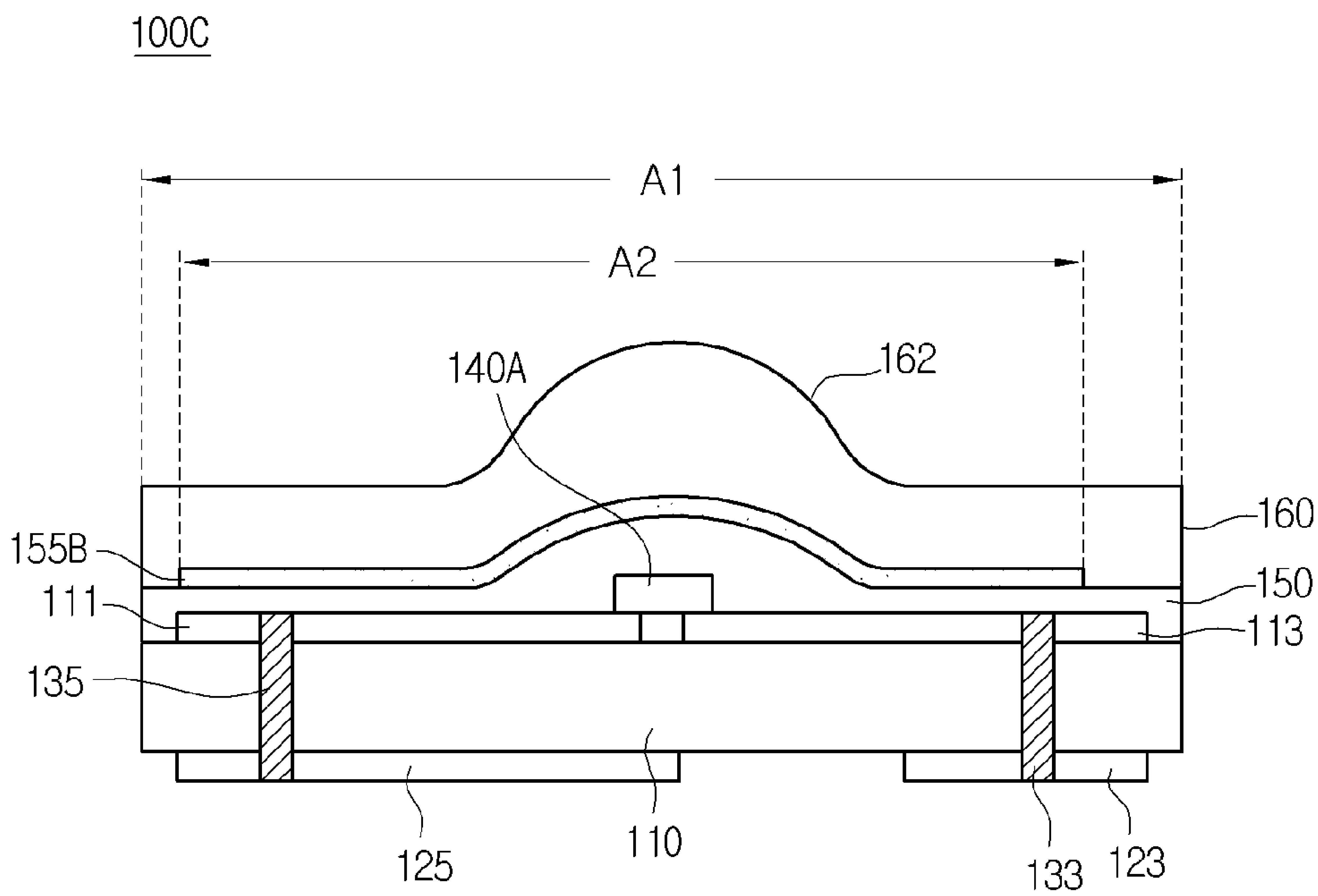

100C
A1
A2
162
140A
160
155B
150
111
113
135
125
110
133
123

FIG.8

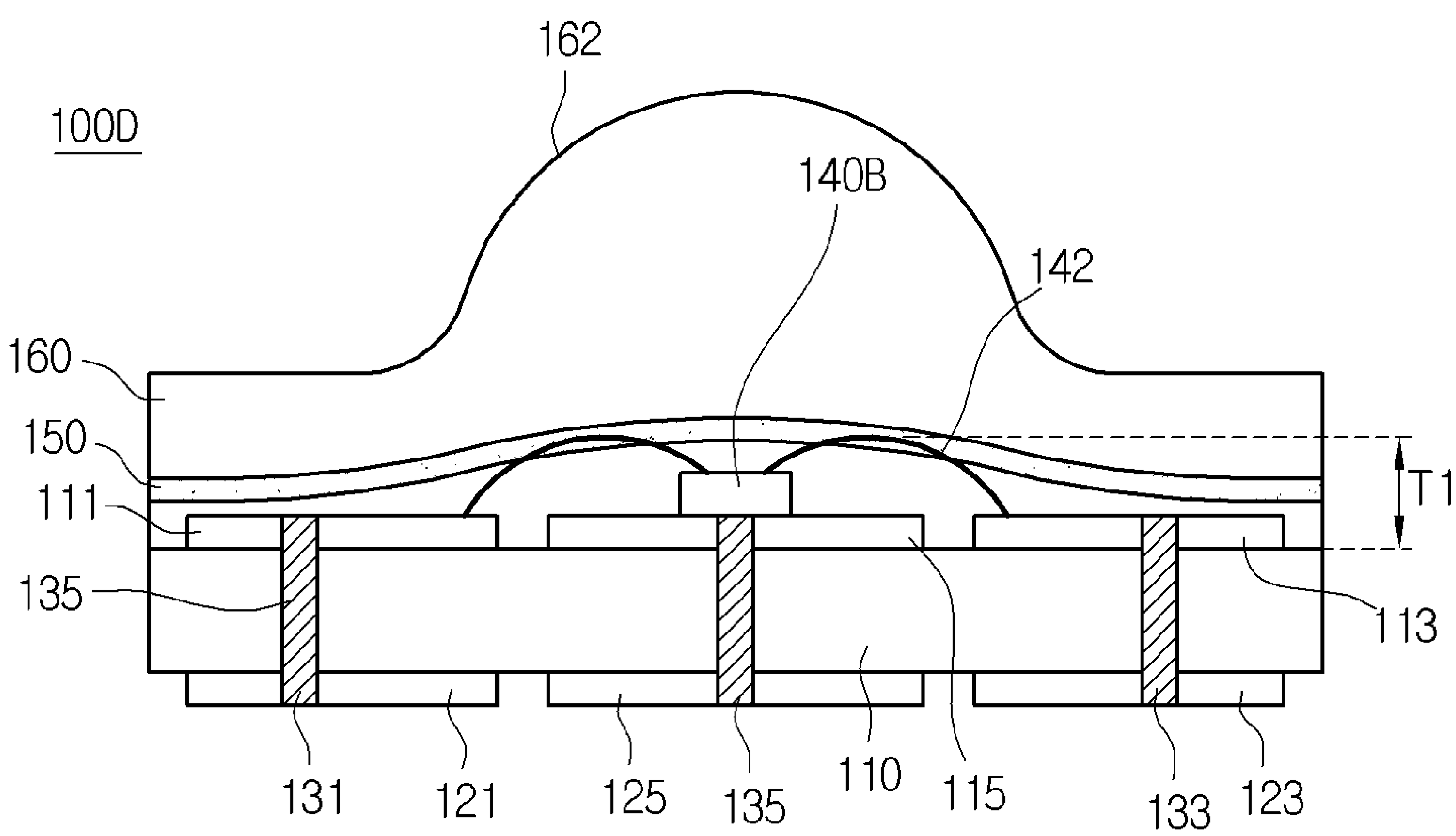

162
100D
140B
142
160
150
T1
111
135
113
131
121
125
135
110
115
133
123

FIG.9

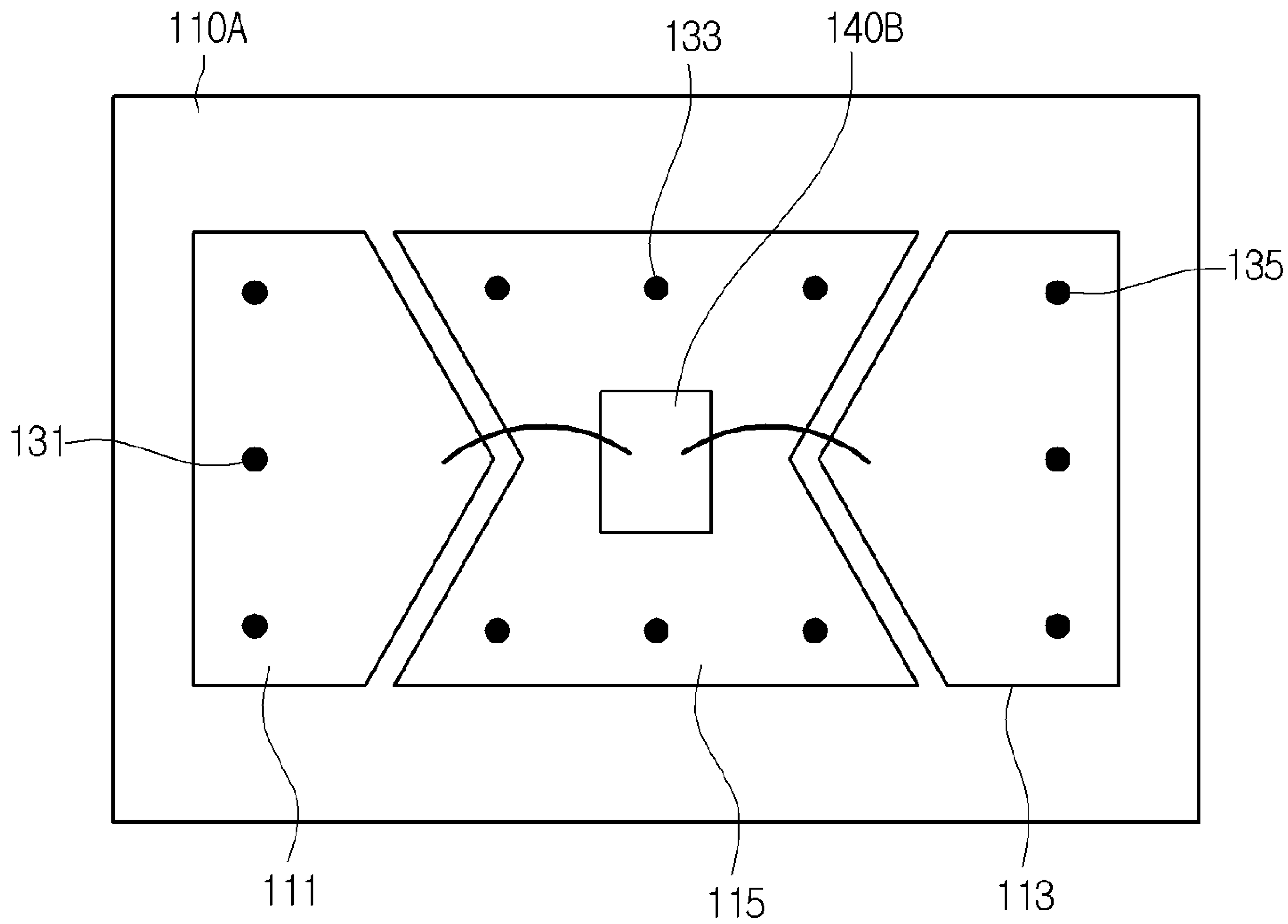



FIG.10

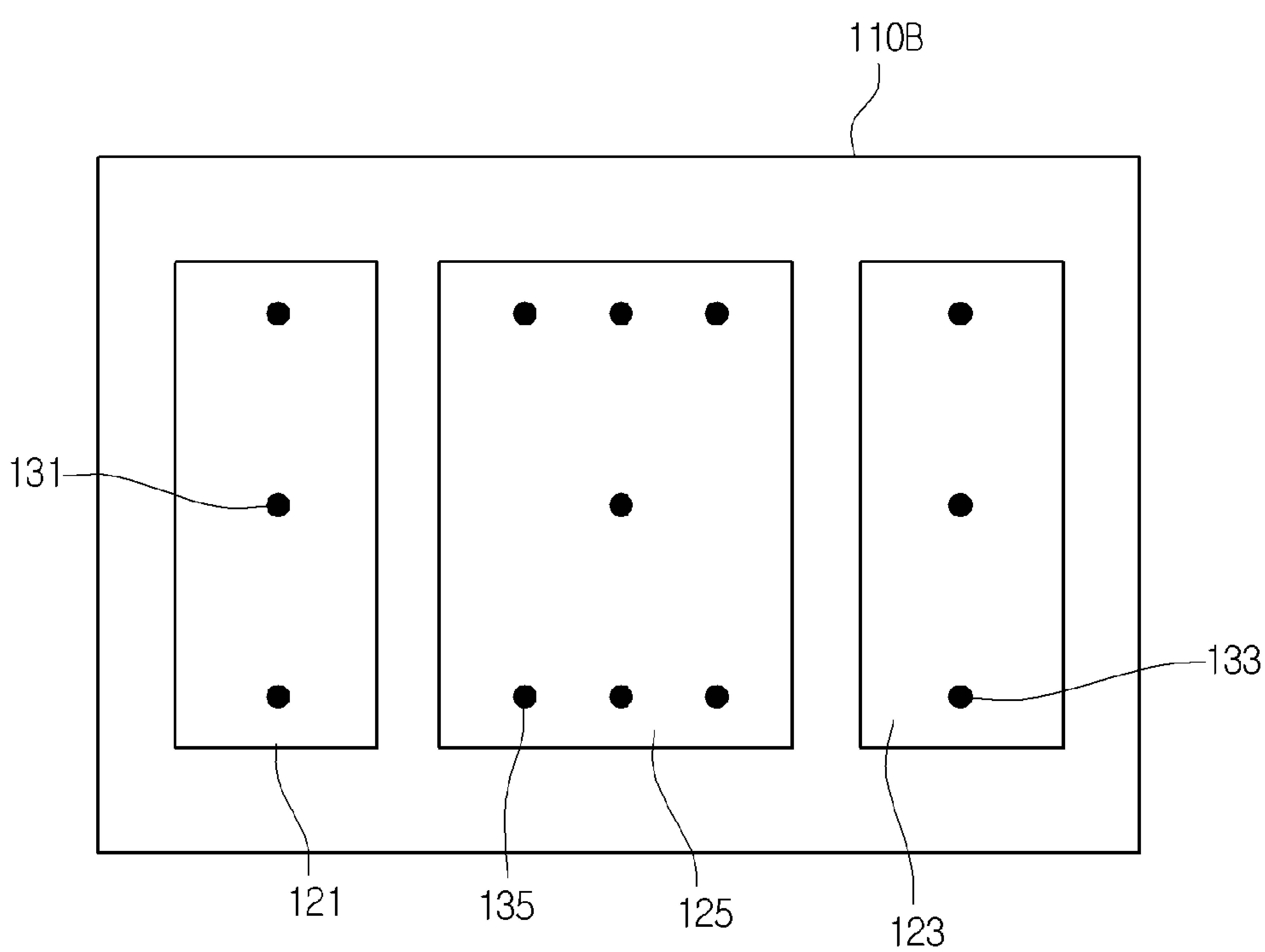
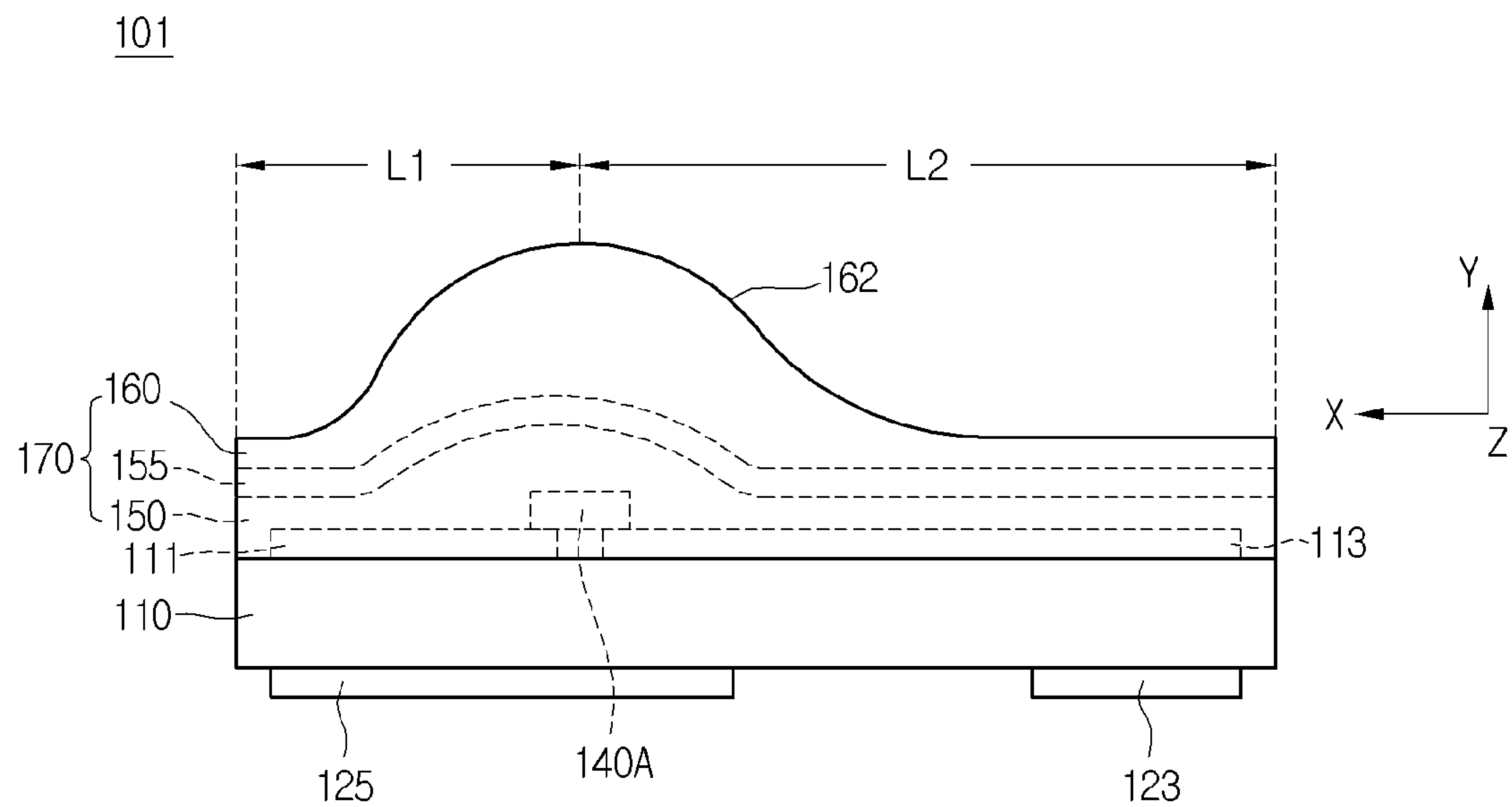
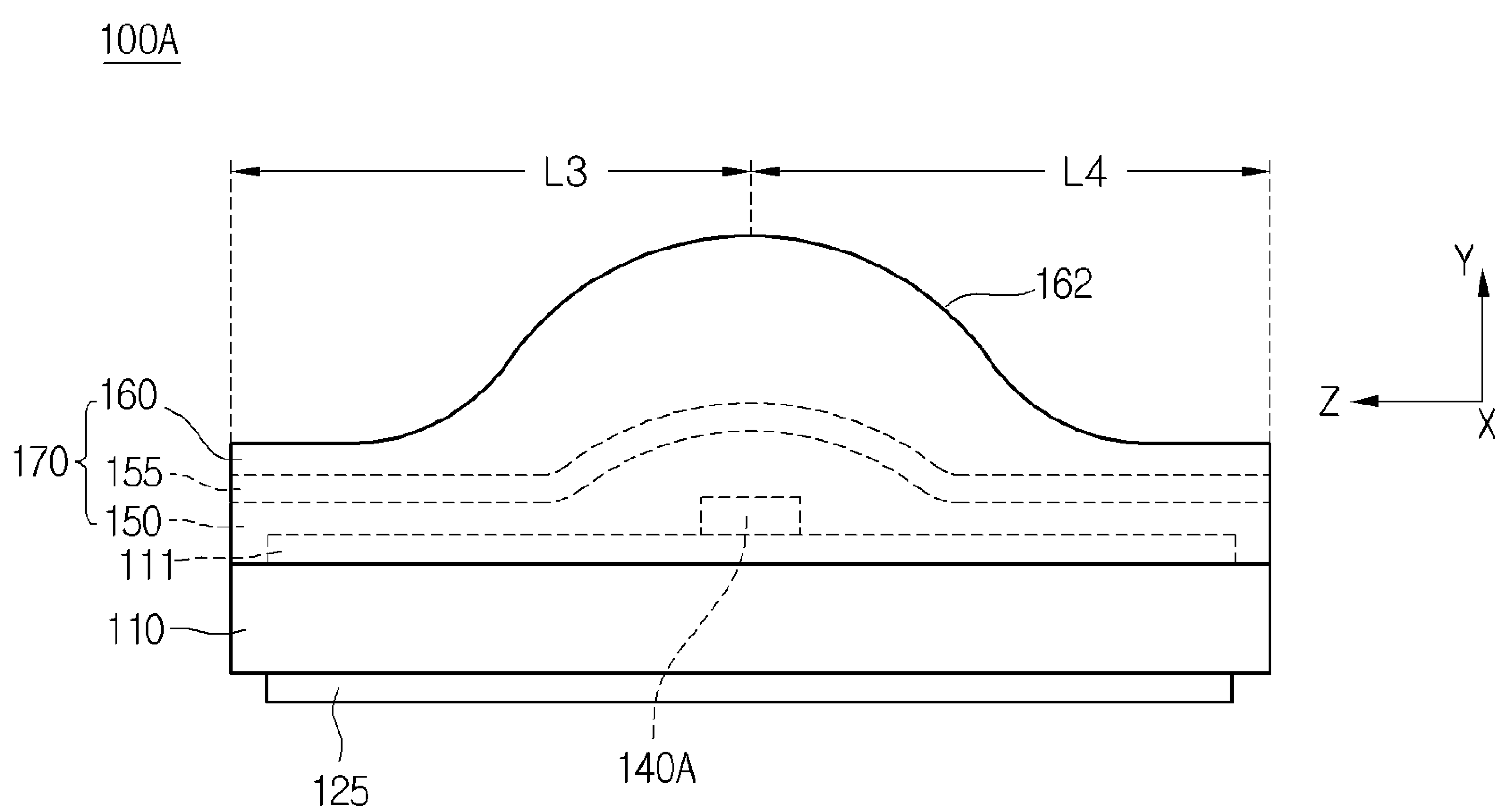


FIG.11



101
L1
L2
162
160
170
155
150
111
110
113
125
140A
123
Y
X
Z


FIG.12



100A
L3
L4
162
160
170
155
150
111
110
125
140A
Y
Z
X

FIG.13

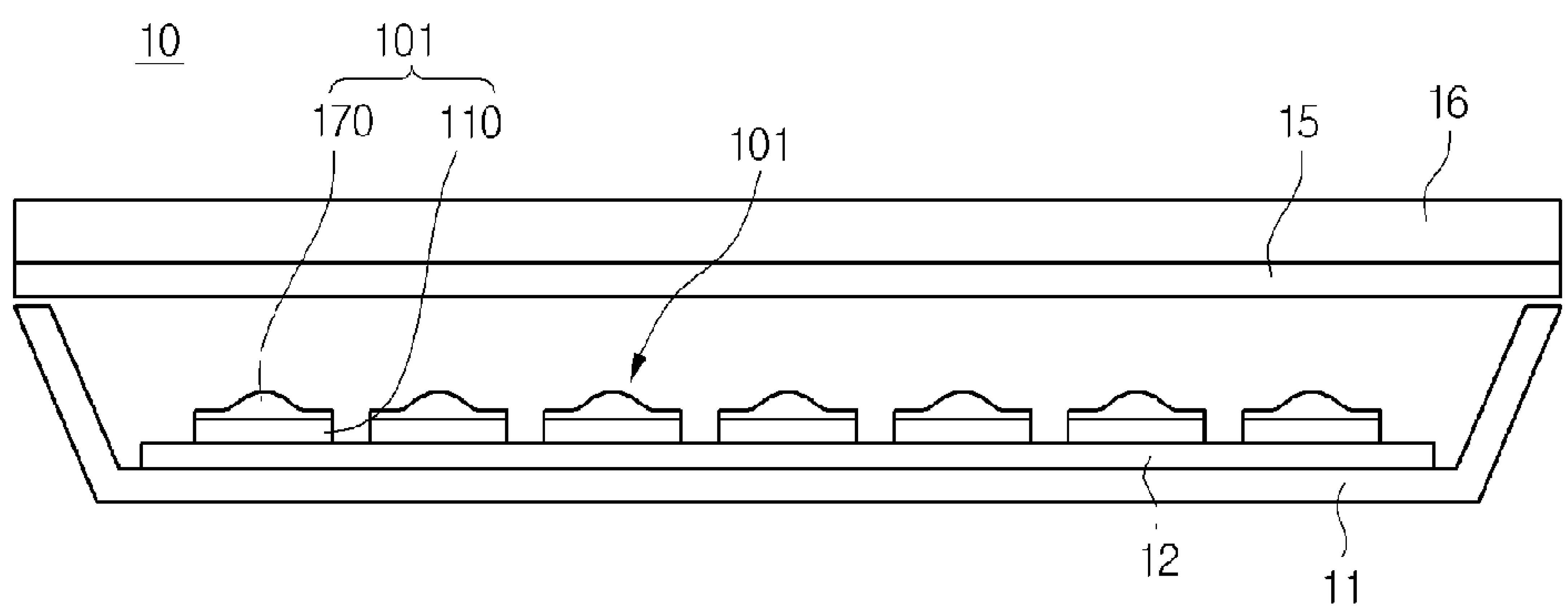
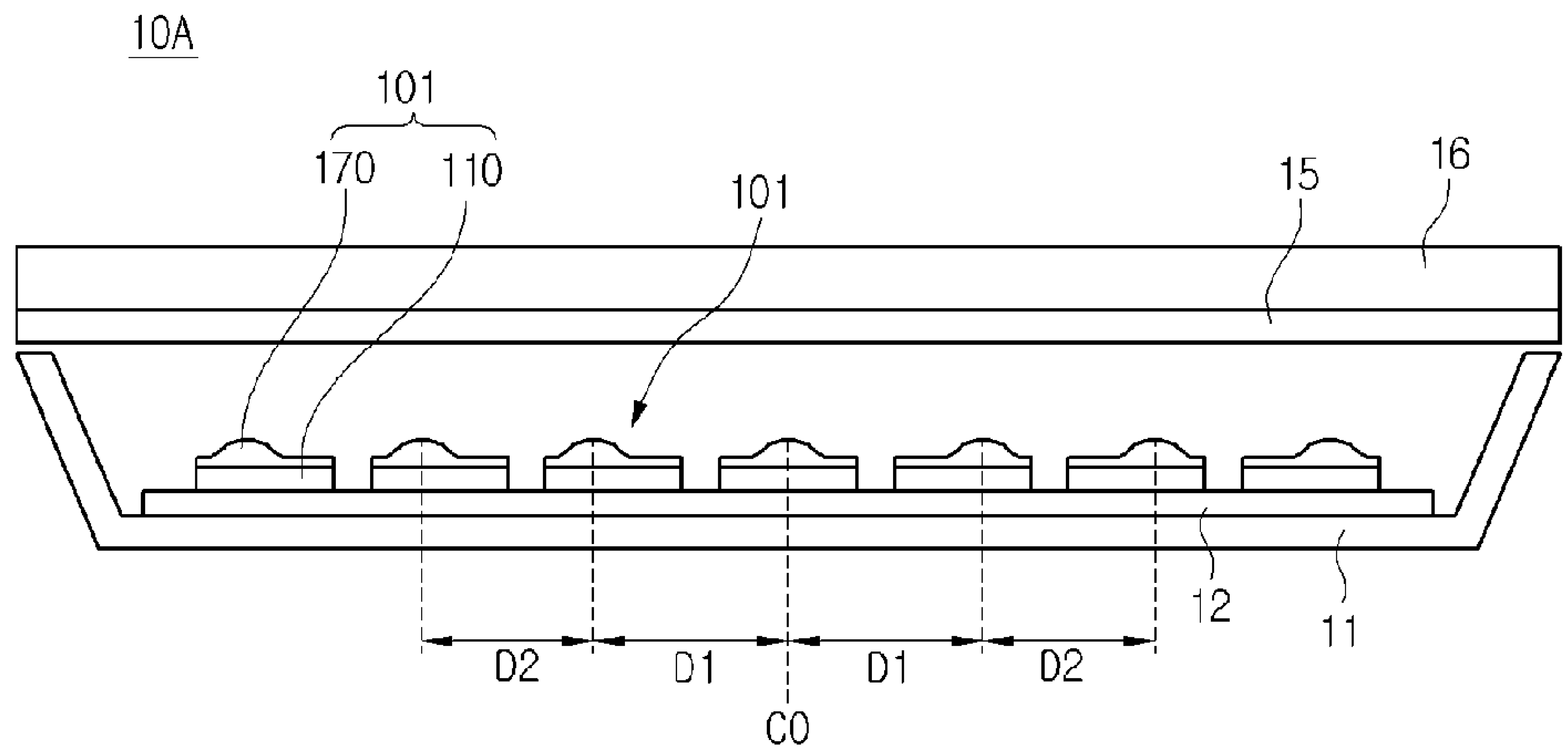

10
101
170
110
101
15
16
12
11

FIG.14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101
170
110
101
15
16
12
11
D2
D1
D1
D2
C0

FIG.15

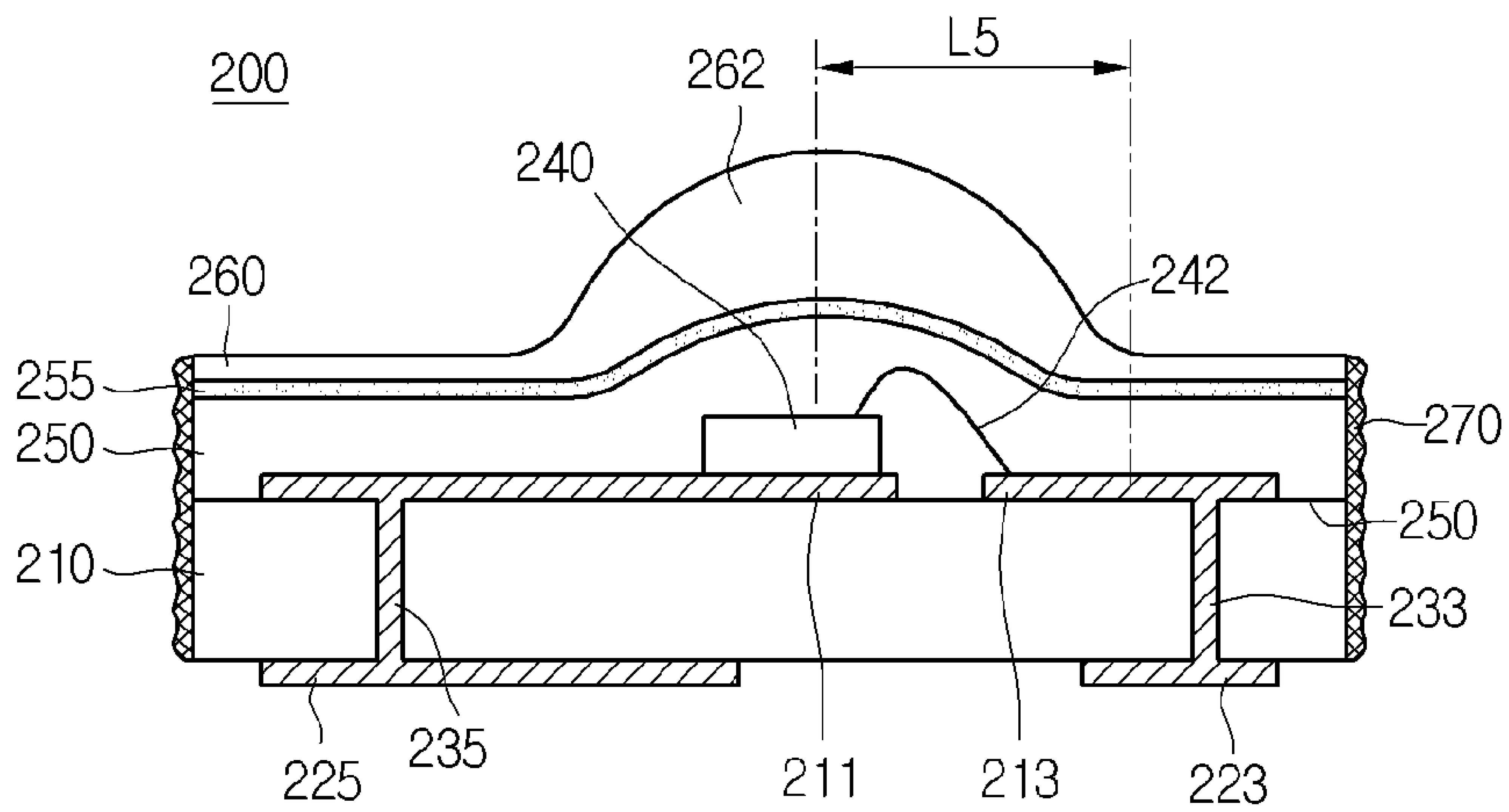
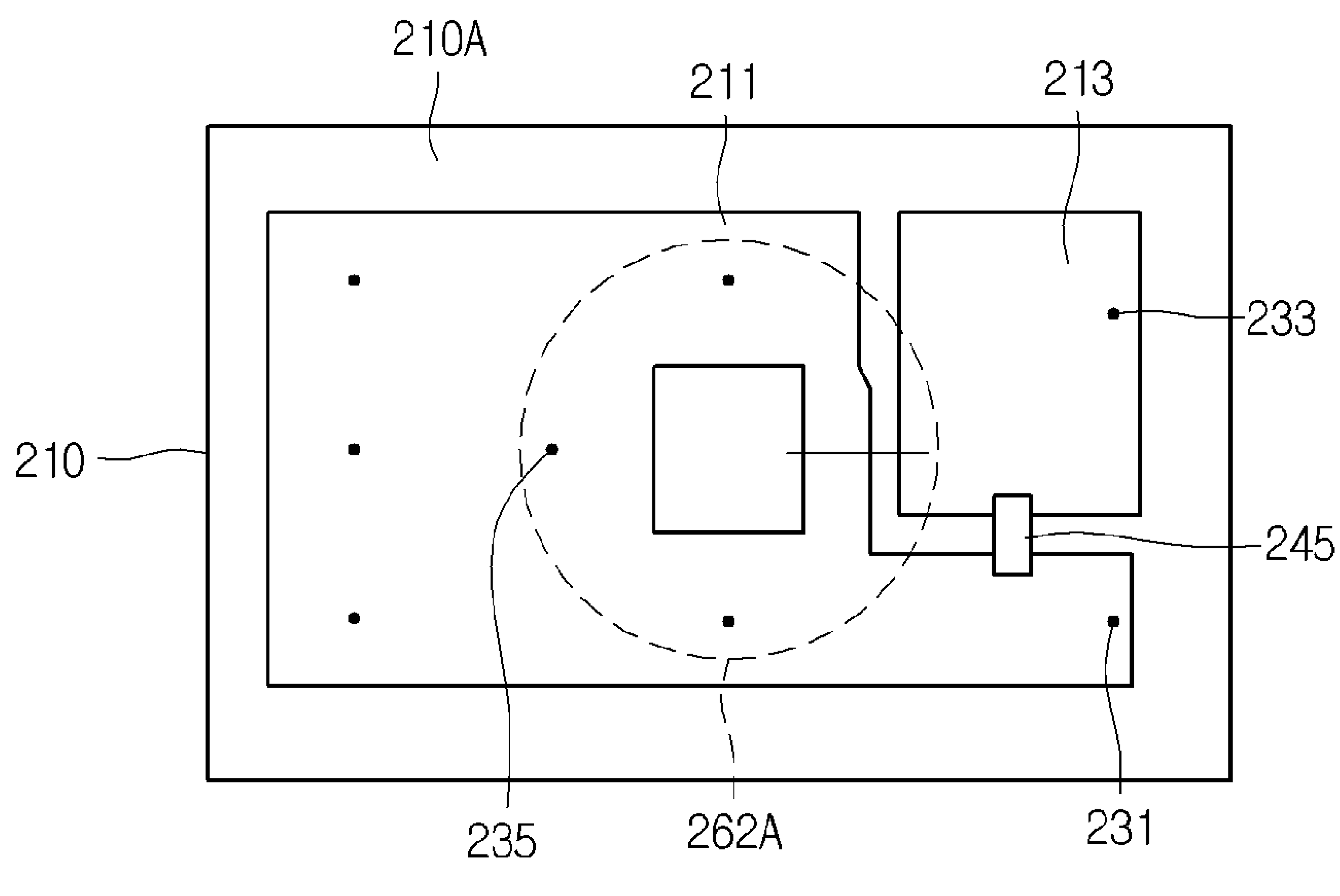

200
262
L5
240
242
260
255
250
270
250
210
233
225
235
211
213
223

FIG.16


210A
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245
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262A
231

FIG.17

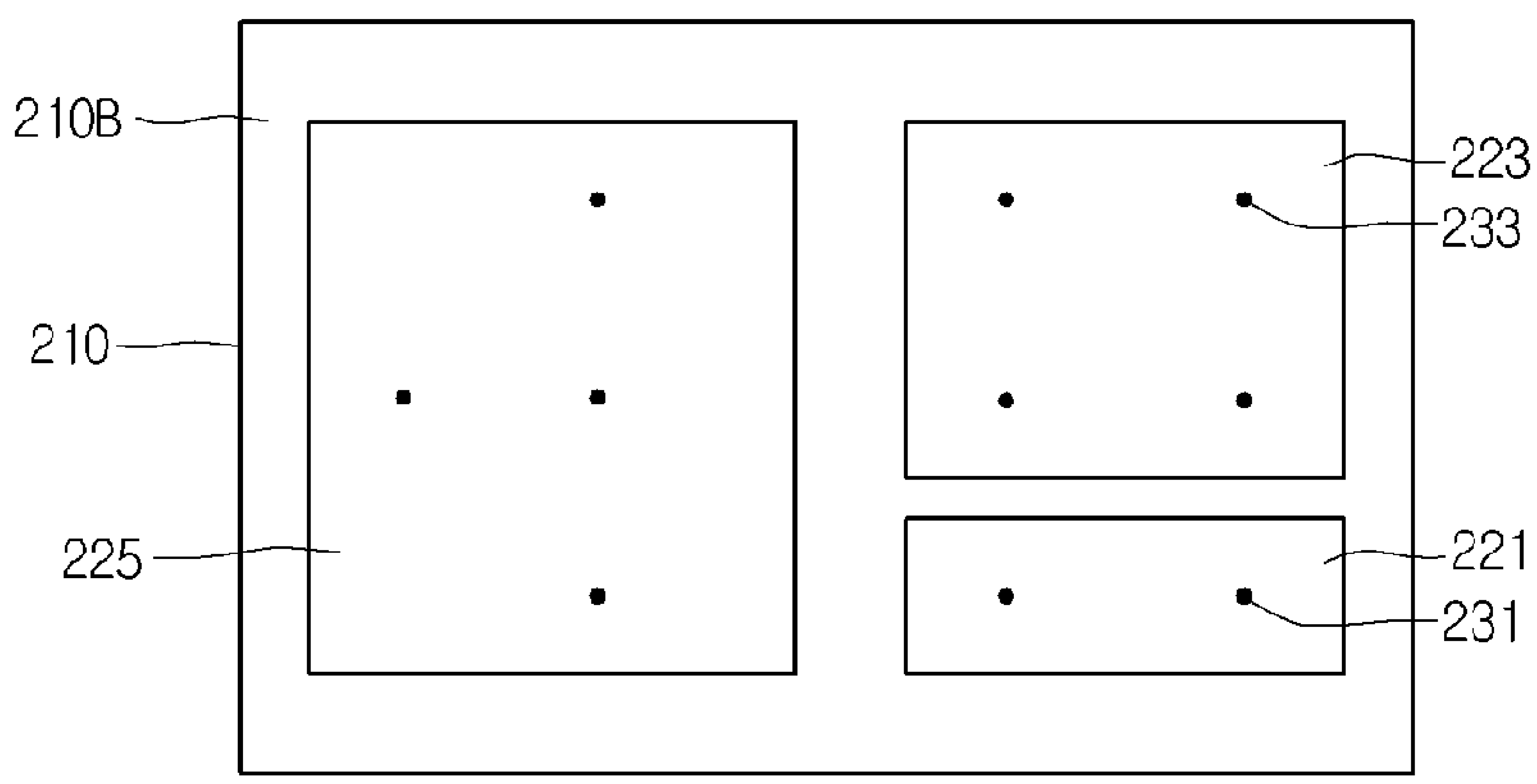



FIG.18

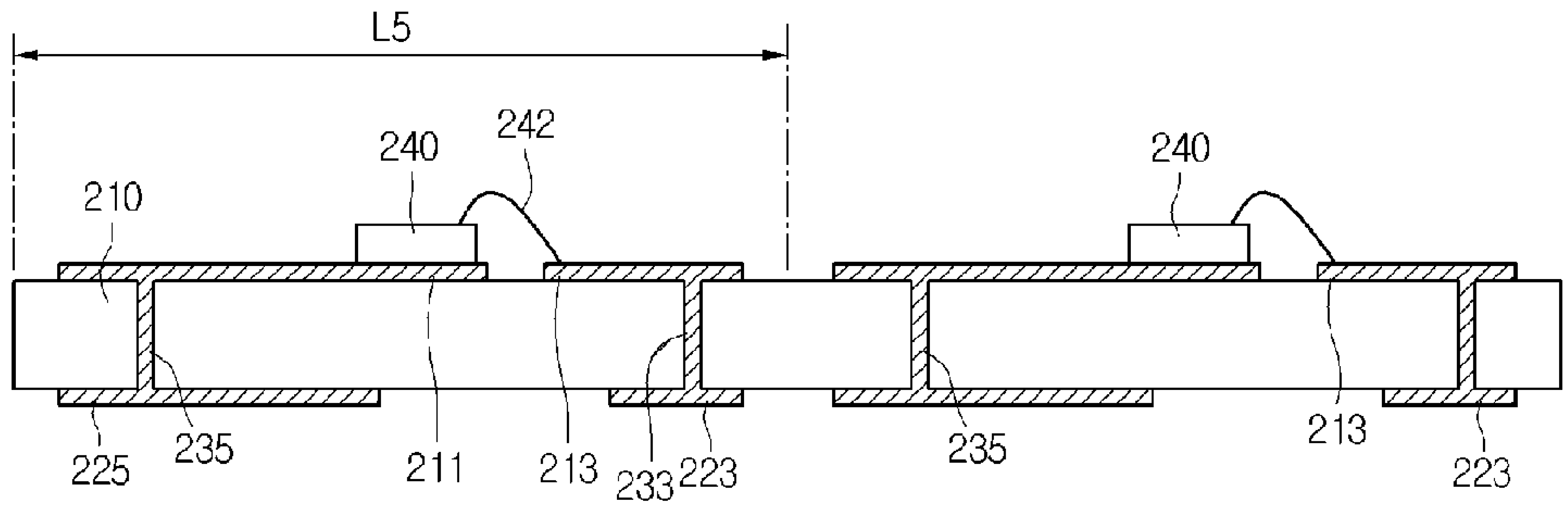



FIG.19

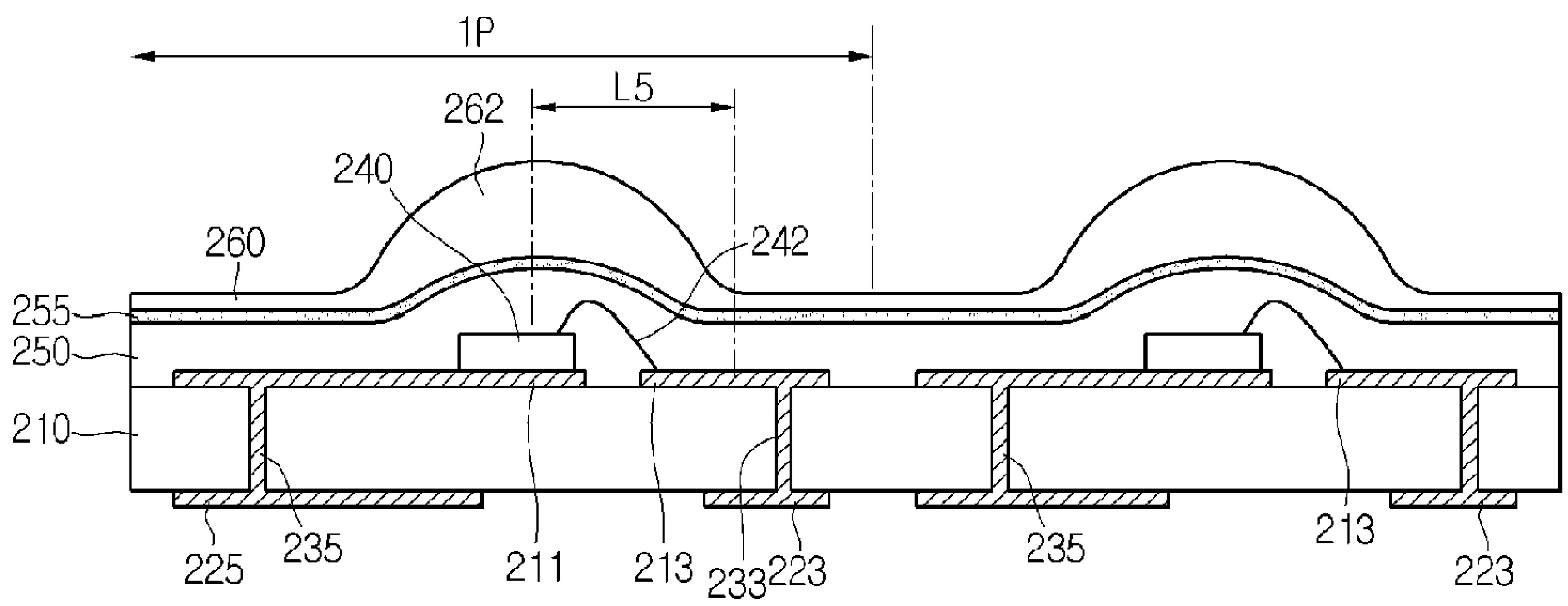
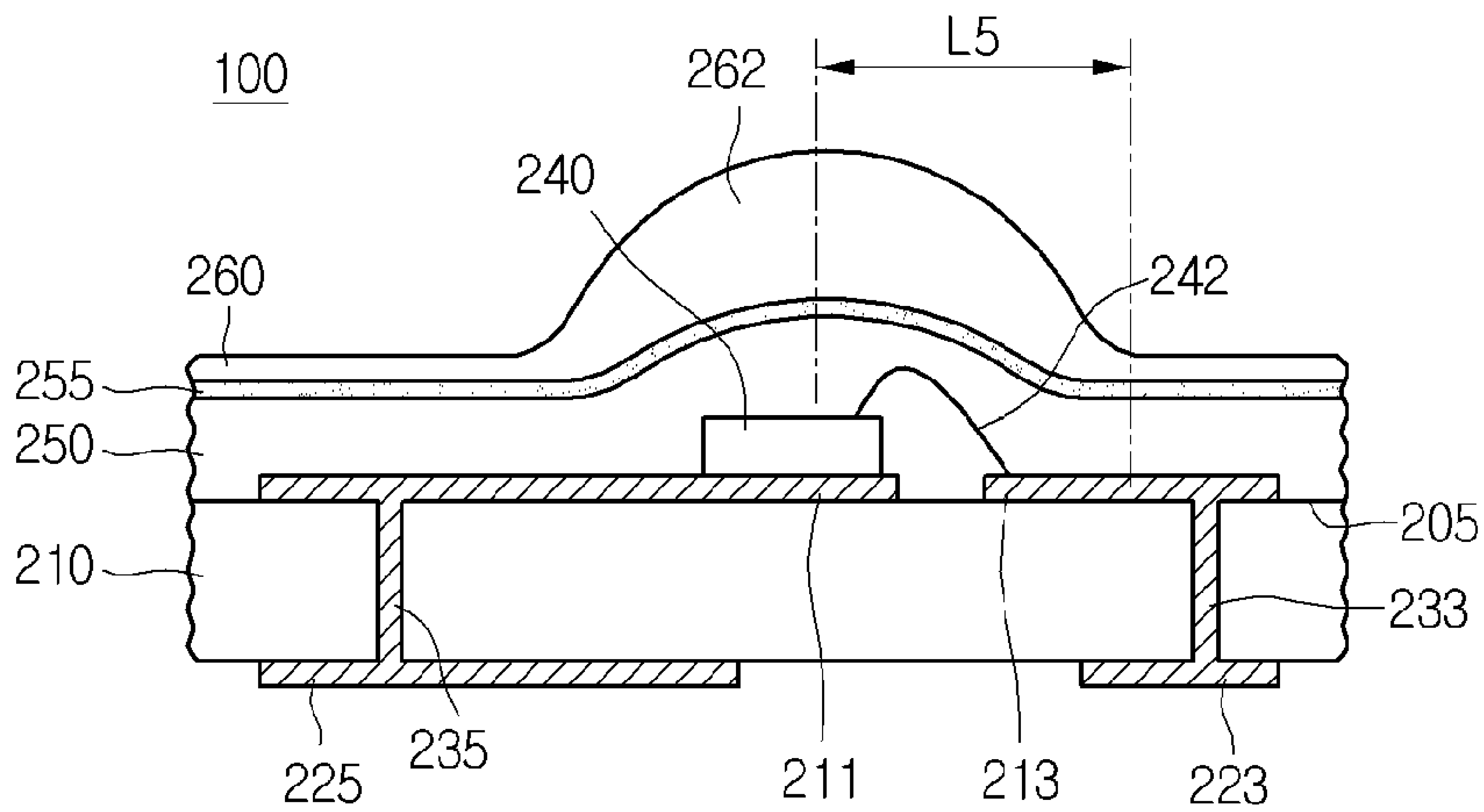


FIG.20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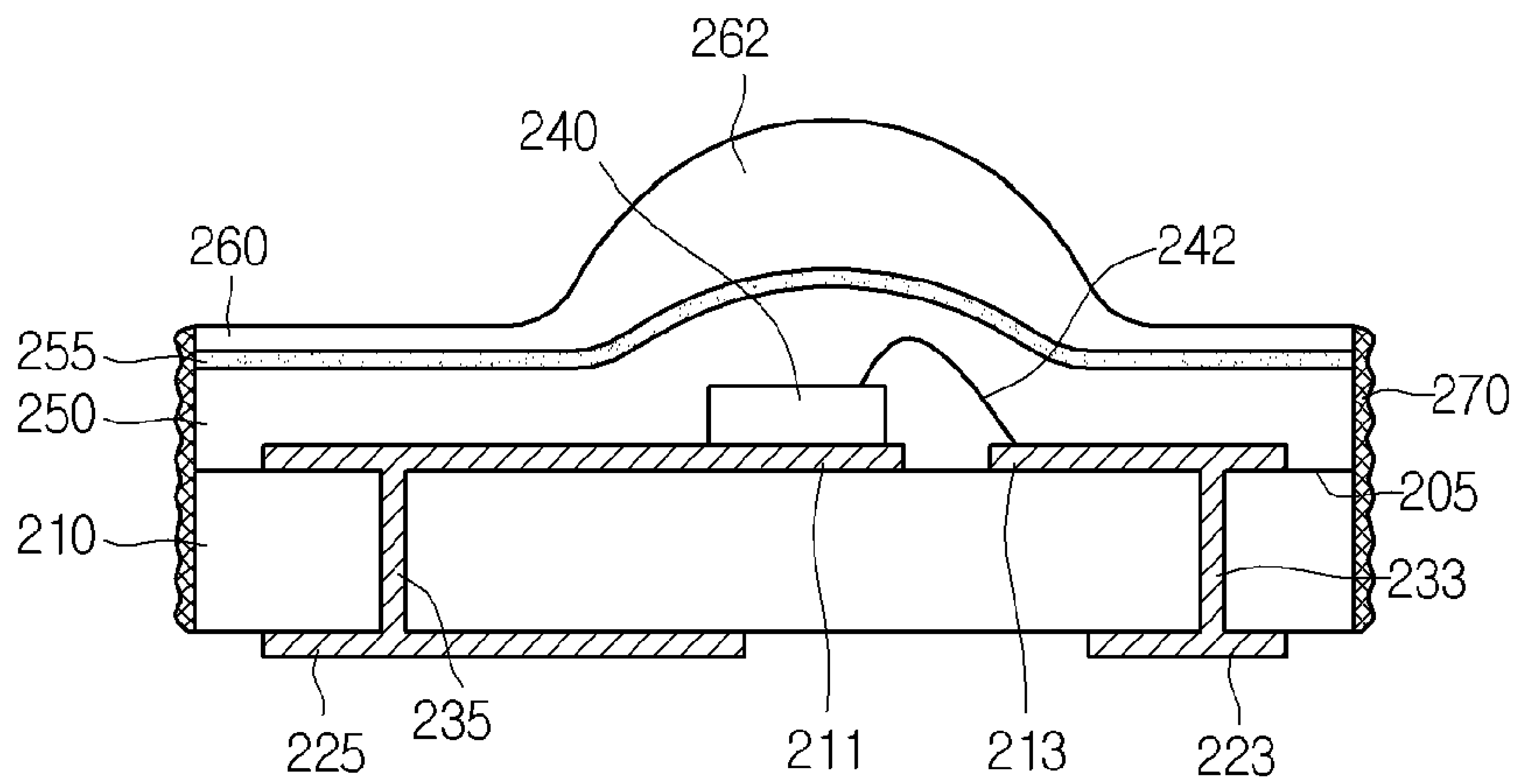
242
255
250
205
210
233
225
235
211
213
223

FIG.21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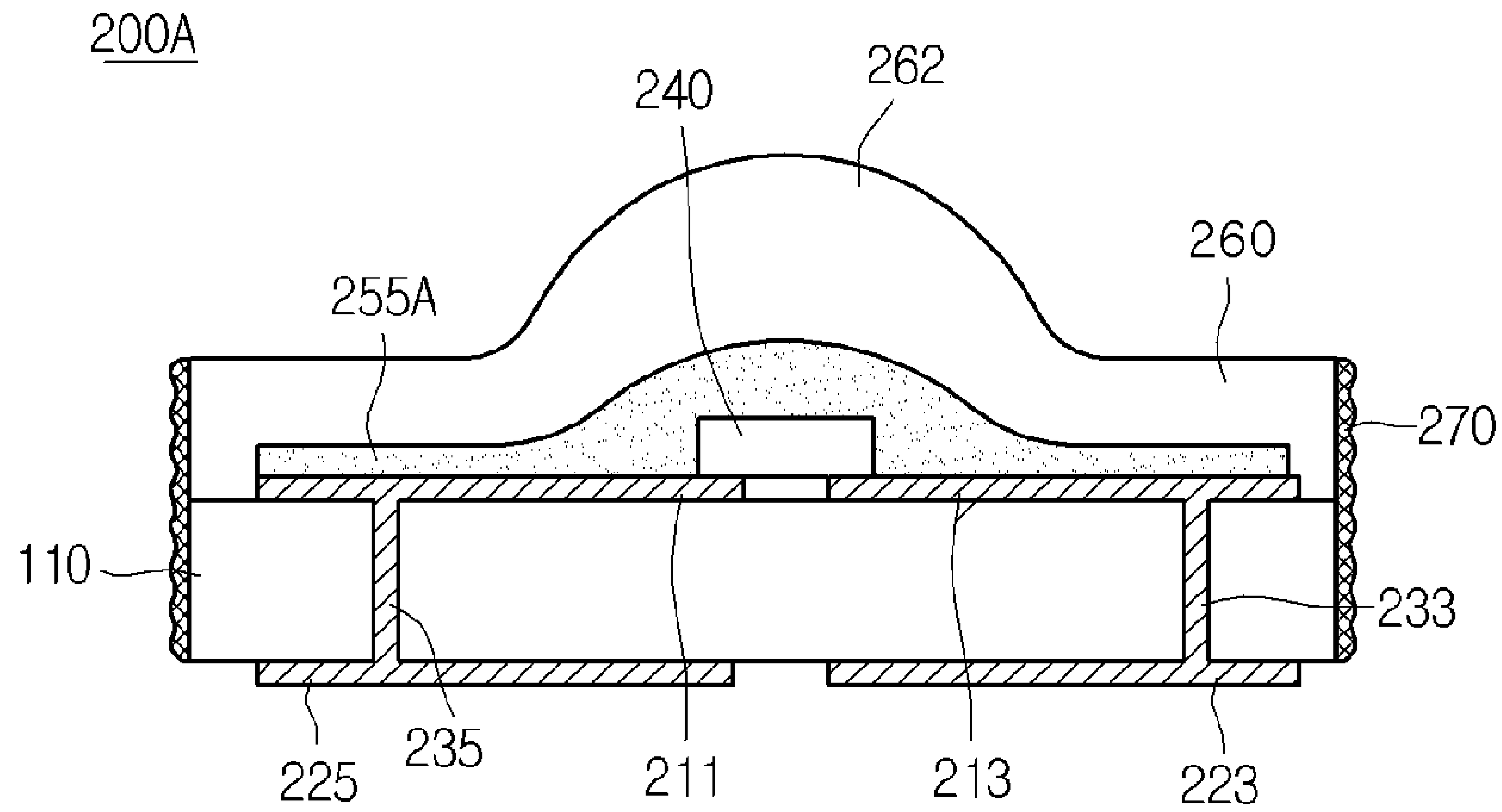
270
250
205
210
233
225
235
211
213
223

FIG.22


200A
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233
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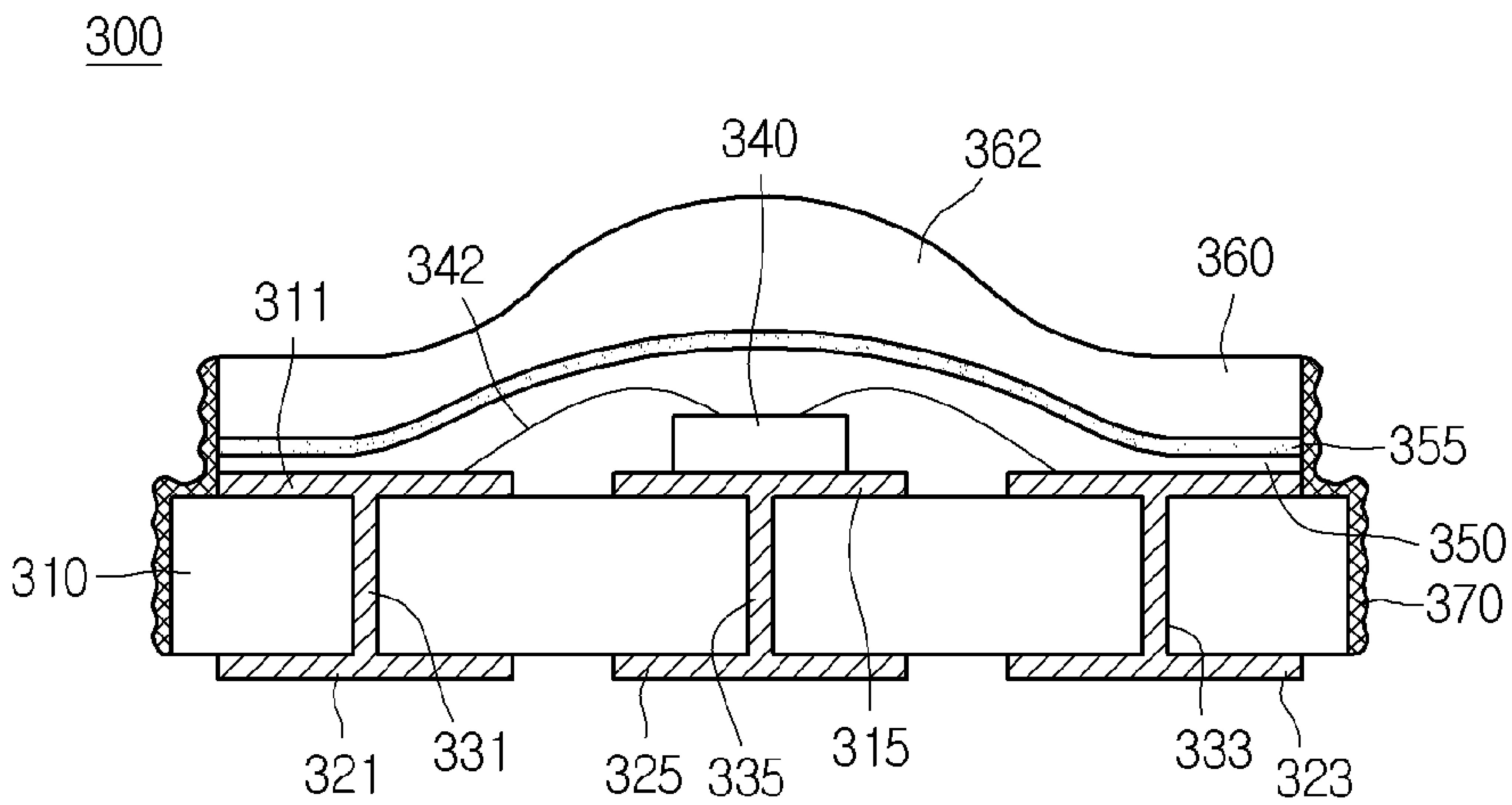
235
211
213
223

FIG.23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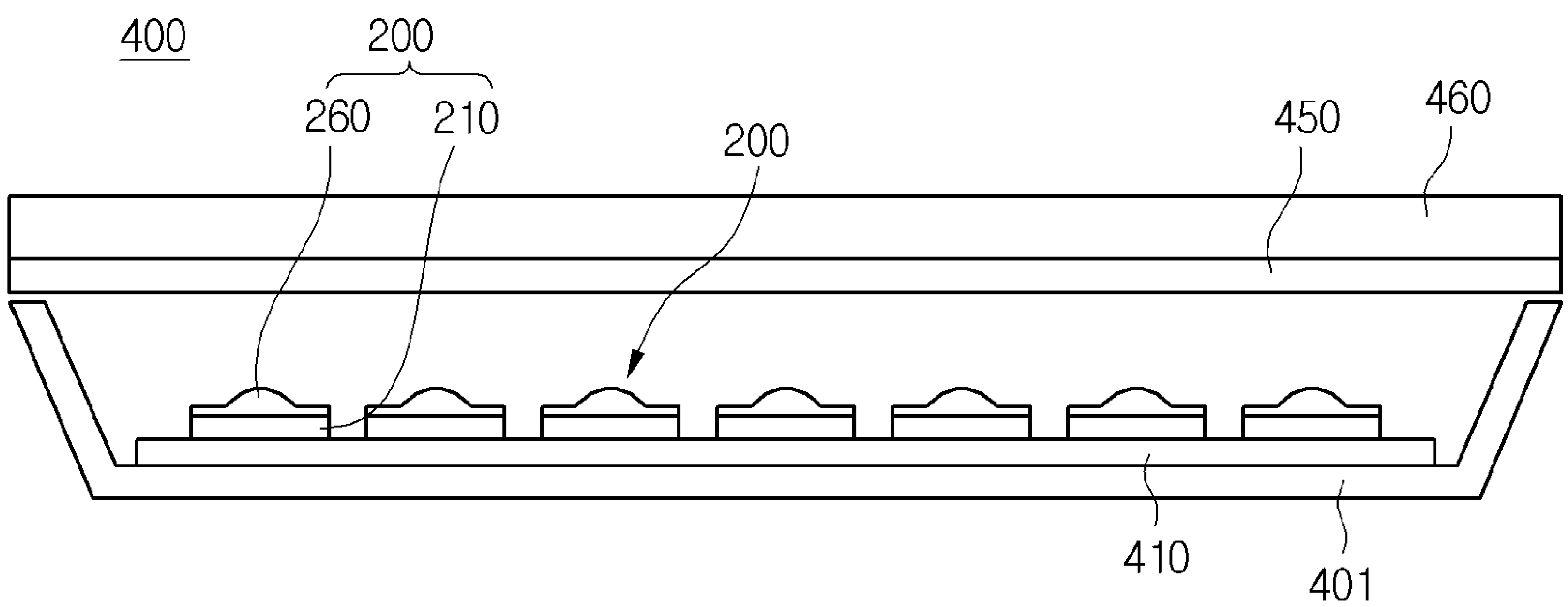
333
323

FIG.24



# LIGHT EMITTING DEVICE PACKAGE AND LIGHT UNIT HAVING THE SAME

The present application claims priorities of Korean Patent Application Nos. 10-2010-0030019 and 10-2010-0030020 filed on Apr. 1, 2010, which are hereby incorporated by reference in their entirety.

## BACKGROUND

The embodiment relates to a light emitting device package and a light unit having the same.

A light emitting diode (LED) may constitute a light source for generating light by using GaAs, AlGaAs, GaN, InGaN, and InGaAlP-based compound semiconductor materials.

Such an LED is packaged so as to be used as a light emitting device that emits lights having various colors. The light emitting device is used as a light source in various products such as a lighting indicator, a character indicator, and an image display.

## SUMMARY


The embodiment provides a light emitting device package having a novel structure.

The embodiment provides a light emitting device package including a ceramic substrate, a light emitting device on the ceramic substrate, a light-transmissive resin layer on the light emitting device, and a phosphor layer on the light-transmissive resin layer.

The embodiment provides a light emitting device package including a phosphor layer disposed between light-transmissive resin layers.

The embodiment provides a light emitting device package capable of preventing moisture from penetrating into the light emitting device package through an interfacial surface between a planar type substrate and a resin layer.

The embodiment provides a light emitting device package including a moisture barrier layer provided at an outer portion of the substrate.

The embodiment can improve the reliability of a lighting system, such as a display device, an indicator or a lighting device having the light emitting device package.

A light emitting device package according to the embodiment includes a ceramic substrate; a light emitting device on the ceramic substrate; a first light-transmissive resin layer on the ceramic substrate to cover the light emitting device; and a phosphor layer on the first light-transmissive resin layer, wherein the first light-transmissive resin layer has a same width that of the ceramic substrate.

A light emitting device package according to the embodiment includes a substrate; a light emitting device on the substrate; a resin layer on the substrate; and a moisture barrier layer on the substrate and an outer portion of the resin layer.

A light unit according to the embodiment includes a light emitting device package including a planar type ceramic substrate, a light emitting device on the ceramic substrate, a first light-transmissive resin layer on the ceramic substrate to seal the light emitting device, and a phosphor layer on the first light-transmissive resin layer; a module substrate on which the light emitting device package is arrayed; and a light guide plate or an optical sheet at one side of the light emitting device package.


## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side sectional view showing a light emitting device package according to the first embodiment;



FIG. **2** is a perspective view showing a top surface pattern of a ceramic substrate shown in FIG. **1**;

FIG. **3** is a bottom view showing a lower surface pattern of a ceramic substrate shown in FIG. **1**;

FIG. **4** is a side sectional view showing a light emitting device package according to the second embodiment;

FIG. **5** is a plan view showing a top surface pattern of a ceramic substrate shown in FIG. **4**;

FIG. **6** is a side sectional view showing a light emitting device package according to the third embodiment;

FIG. **7** is a side sectional view showing a light emitting device package according to the fourth embodiment;

FIG. **8** is a side sectional view showing a light emitting device package according to the fifth embodiment;

FIG. **9** is a plan view showing a top surface pattern of a ceramic substrate shown in FIG. **8**;

FIG. **10** is a bottom view showing a lower surface pattern of a ceramic substrate shown in FIG. **8**;

FIGS. **11** and **12** are side views showing an external appearance of a package according to the embodiment;

FIG. **13** is a side sectional view showing a display device according to the sixth embodiment;

FIG. **14** is a view showing another arrangement of the light emitting device package shown in FIG. **13**;

FIG. **15** is a side sectional view showing a light emitting device package according to the seventh embodiment;

FIG. **16** is a plan view showing a top surface pattern of a ceramic substrate shown in FIG. **15**;

FIG. **17** is a bottom view showing a lower surface pattern of a ceramic substrate shown in FIG. **15**;

FIGS. **18** to **21** are sectional views showing the procedure for manufacturing a light emitting device package according to the seventh embodiment;

FIG. **22** is a side sectional view showing a light emitting device package according to the eighth embodiment;

FIG. **23** is a side sectional view showing a light emitting device package according to the ninth embodiment; and

FIG. **24** is a view showing a display device including a light emitting device package according to the embodiment.

## DETAILED DESCRIPTION OF THE EMBODIMENTS

In the description of the embodiments, it will be understood that, when a layer (or film), a region, a pattern, or a structure is referred to as being "on" or "under" another substrate, another layer (or film), another region, another pad, or another pattern, it can be "directly" or "indirectly" on the other substrate, layer (or film), region, pad, or pattern, or one or more intervening layers may also be present. Such a position of the layer has been described with reference to the drawings.

The thickness and size of each layer shown in the drawings may be exaggerated, omitted or schematically drawn for the purpose of convenience or clarity. In addition, the size of elements does not utterly reflect an actual size.

Hereinafter, exemplary embodiments will be described with reference to accompanying drawings. FIG. **1** is a side sectional view showing a light emitting device package according to the first embodiment, FIG. **2** is a perspective view showing a top surface pattern of a ceramic substrate shown in FIG. **1**, and FIG. **3** is a bottom view showing a lower surface pattern of the ceramic substrate shown in FIG. **1**.

Referring to FIGS. **1** to **3**, the light emitting device package **100** includes a substrate **110**, first and second electrode patterns **111** and **113**, third and fourth electrode patterns **121** and **123**, a heat radiation pattern **125**, conductive vias **131**, **133** and **135**, a light emitting device **140**, a first light-transmissive resin layer **150** and a phosphor layer **155**.

The substrate **110** has a superior heat-resistant property and a superior tarnish-resistant property against heat. The substrate **110** may include alumina, quartz, calcium zirconate, forsterite, SiC, graphite, fused silica, mullite, cordierite, zirconia, beryllia, aluminum nitride, or LTCC (low temperature co-fired ceramic). For the purpose of convenience of explanation, the ceramic substrate will be described below as an example of the substrate **110**.

The ceramic substrate **110** may be prepared as a single-layer substrate or a multiple-layer substrate by using the structure of a single-side copper foil layer or a dual-side copper foil layer. The copper foil layer may be prepared as a metal plate by selectively using a conductive metal, such as Cu, Ag, Al, Ni, or Au and may have a predetermined pattern formed through an etching process. The ceramic substrate **110** may have a circular shape or a polygonal shape, but the embodiment is not limited thereto.

Referring to FIGS. **2** and **3**, the first and second electrode patterns **111** and **113** are formed on a top surface **110**A of the ceramic substrate **110**, and the third and fourth electrode patterns **121** and **123** and the heat radiation pattern **125** are formed on a lower surface **110**B of the ceramic substrate **110**. The first electrode pattern **111** is connected to the third electrode pattern **121** through at least one conductive via **131** such that a part of the first electrode pattern **111** may correspond to a part of the third electrode pattern **121**. In addition, the second electrode pattern **113** is connected to the fourth electrode pattern **123** through at least one conductive via **133** such that a part of the second electrode pattern **113** may correspond to a part of the fourth electrode pattern **123**.

A size of the first electrode pattern **111** may be larger than a size of the second electrode pattern **113** and the first electrode pattern **111** may branch in various directions to dissipate heat generated from the light emitting device **140**.

The heat radiation pattern **125** may be formed on the lower surface **110**B of the ceramic substrate **110** corresponding to the first electrode pattern **111**. The first electrode pattern **111** is connected to the heat radiation pattern **125** through at least one third conductive via **135** such that a part of the first electrode pattern **111** may correspond to a part of the heat radiation pattern **125**. The heat radiation pattern **125** may have a size larger than that of the third and fourth electrode patterns **121** and **123**.

The light emitting device **140** is formed on the first electrode pattern **111**. In detail, the light emitting device **140** is mounted on the first electrode pattern **111** by using a conductive adhesive or a solder.

The second electrode pattern **113** is spaced apart from the first electrode pattern **111** and connected to the light emitting device **140** through a wire **142**.

The first and second electrode patterns **111** and **113** are positioned corresponding to the center region of the ceramic substrate **110** and electrically connected to the light emitting device **140**.

The light emitting device **140** can be connected to the first and second electrode patterns **111** and **113** through a die bonding scheme, a flip chip bonding scheme or a wire bonding scheme according to the position of an electrode of a chip or a type of the chip, but the embodiment is not limited thereto.

As shown in FIGS. **1** to **3**, the first to third conductive vias **131**, **133** and **135** are formed through the ceramic substrate **110** such that the patterns formed on the ceramic substrate **110** can be connected to the patterns formed under the ceramic substrate **110**. The first to third conductive vias **131**, **133** and **135** of the ceramic substrate **110** can be formed by filling via holes or through holes with conductive materials, such as Ag, or coating the conductive materials around the via holes or through holes. The third electrode pattern **121** can be integrally formed with the heat radiation pattern **125**. Such a configuration of the patterns may vary depending on the heat radiation efficiency. The conductive vias **131**, **133** and **135** are a conductive connective member.

The light emitting device **140** is an LED (light emitting diode) chip including a color LED chip, such as blue LED chip, a green LED chip, or a red LED chip, or a UV LED chip. At least one light emitting device **140** may be disposed on the ceramic substrate **110**.

Referring to FIG. **1**, a resin layer having a refractive index lower than that of a semiconductor medium of the light emitting device **140** may be formed on the ceramic substrate **110**. The resin layer is an encapsulant layer to cover the light emitting device **140** and may include a phosphor material. For instance, the resin layer may include the first light-transmissive resin layer **150** and the phosphor layer **155**.

The first light-transmissive resin layer **150** is formed on the ceramic substrate **110**, and the phosphor layer **155** is formed on the first light-transmissive resin layer **150**. The first light-transmissive resin layer **150** and the phosphor layer **155** may include a resin material, such as silicon, epoxy, or hybrid resin, but the embodiment is not limited thereto.

The first light-transmissive resin layer **150** encapsulants the light emitting device **140** and the first and second electrode patterns **111** and **113**. The first light-transmissive resin layer **150** may have a predetermined thickness larger than a thickness of the light emitting device **140**. The first light-transmissive resin layer **150** may be uniformly formed on the ceramic substrate **110** or may be unevenly formed on the ceramic substrate **110** according to the configuration of the structure.

The phosphor layer **155** may be formed on the first light-transmissive resin layer **150** through a molding process or a coating process. The phosphor layer **155** may include at least one type of phosphor materials, but the embodiment is not limited thereto. The phosphor layer **155** can be formed over the whole area of the first light-transmissive resin layer **150** with a predetermined thickness.

The phosphor material of the phosphor layer **155** excites the light emitted from the light emitting device **140** so that the light has a long wavelength. For instance, the phosphor layer **155** may selectively include a green phosphor material, a red phosphor material or a red phosphor material. In addition, the phosphor material may allow the light to have a complementary color with respect to the color spectrum of the light emitting device **140**.

Since the first light-transmissive resin layer **150** is disposed between the phosphor layer **155** and the light emitting device **140**, the light emitted from the light emitting device **140** is diffused by the first light-transmissive resin layer **150** and a part of the diffused light may be absorbed in the phosphor layer **155** and then emitted to the outside. Thus, the light emitted through the phosphor layer **155** may have a uniform color distribution.

The phosphor layer **155** may have a same width that of the first light-transmissive resin layer **150** and have a thickness thinner than that of the first light-transmissive resin layer **150**. The first light-transmissive resin layer **150** has a same width that of at least one of a lower surface and a top surface of the ceramic substrate **110**.

Since the light emitting device **140** is disposed on the planar type ceramic substrate **110**, the light emitting device **140** may emit the light with an orientation angle of about 120°

or above. In addition, since the phosphor layer **155** is formed over the whole area of the ceramic substrate **110**, the light emitting device package **100** can emit the light at the above orientation angle with the uniform color distribution.

FIG. **4** is a side sectional view showing a light emitting device package according to the second embodiment, and FIG. **5** is a plan view showing the light emitting device and a protective pattern formed on a pattern of a ceramic substrate shown in FIG. **4**. The following description of the second embodiment will be made with reference to the first embodiment.

Referring to FIGS. **4** and **5**, the light emitting device package **100**A includes a light emitting device **140**A, a first light-transmissive resin layer **150**, a phosphor layer **155** and a second light-transmissive resin layer **160**.

The light emitting device **140**A can be mounted on the first and second electrode patterns **111** and **113**, which correspond to each other, through a flip chip scheme by using a conductive bump.

The second light-transmissive resin layer **160** is formed on the phosphor layer **155**. The second light-transmissive resin layer **160** covers the whole top surface of the phosphor layer **155** and is injection-molded by using a same material that of the first light-transmissive resin layer **150**.

The second light-transmissive resin layer **160** includes a lens unit **162**. The center of the lens unit **162** corresponds to an optical axis perpendicular to the light emitting device **140**A. The lens unit **162** has a hemispherical shape protruding upward from the light emitting device **140**A. A maximum diameter of the lens unit **162** is 120 μm or above. The lens unit **162** may be formed of a convex lens.

Referring to FIG. **5**, end portions of the first and second electrode patterns **111** and **113** are disposed at an outer peripheral region of the ceramic substrate **110**. A protective device, such as a Zener diode or a TVS (transient voltage suppression) diode, is electrically connected to the first and second electrode patterns **111** and **113**. For instance, the protective device can be mounted through a flip chip scheme. When comparing the position of the protective device with that of the light emitting device **140**A, the protective device is closer to the outer peripheral portion of the ceramic substrate **110**, so that the light loss of the light emitting device **140**A can be reduced. The protective device **145** can be connected through at least one wire, and the embodiment is not limited thereto.

The lens unit **162** of the second light-transmissive resin layer **160** is disposed on the light emitting device **140**A. Other regions of the second light-transmissive resin layer **160** except for the lens unit **162** are flat, so the second light-transmissive resin layer **160** can be formed on the phosphor layer **155** with a uniform thickness.

FIG. **6** is a side sectional view showing a light emitting device package according to the third embodiment. The following description of the third embodiment will be made with reference to the first embodiment.

Referring to FIG. **6**, the light emitting device package **100**B includes a first light-transmissive resin layer **150**A having a third width A**3**, a phosphor layer **155**A having a second width A**2** and a second light-transmissive resin layer **160**A having a first width A**1**, which are formed on a top surface of the ceramic substrate **110**. The first to third widths satisfy A1<A2<A3. The first to third widths A**1**, A**2** and A**3** are defined on the basis of one lateral side of the ceramic substrate **110**.

Thus, the phosphor layer **155**A surrounds the top surface and the outer lateral sides of the first light-transmissive resin layer **150**A, and the second light-transmissive resin layer **160**A surrounds the top surface and the outer lateral sides of the phosphor layer **155**A. The first light-transmissive resin layer **150**A, the phosphor layer **155**A and the second light-transmissive resin layer **160**A are bonded to the top surface of the ceramic substrate **110**, respectively, so that the moisture can be prevented from penetrating into the light emitting device package **100**B through the interfacial surface between the ceramic substrate **110** and the above layers.

FIG. **7** is a side sectional view showing a light emitting device package according to the fourth embodiment. The following description of the fourth embodiment will be made with reference to the first embodiment.

Referring to FIG. **7**, the light emitting device package **100**C includes a first light-transmissive resin layer **150** on an entire top surface of the ceramic substrate **110**, a phosphor layer **155**B on the first light-transmissive resin layer **150**, and a second light-transmissive resin layer **160** on the phosphor layer **155**B.

A width A**2** of the phosphor layer **155**B is less than a width A**1** of the first light-transmissive resin layer **150** and a width of the second light-transmissive resin layer **160** is equal to the width A**1** of the first light-transmissive resin layer **150**. Accordingly, the second light-transmissive resin layer **160** makes contact with an outer portion of the top surface of the first light-transmissive resin layer **150**, so that the phosphor layer **155**B is sealed between the first light-transmissive resin layer **150** and the second light-transmissive resin layer **160**. The widths A**1** and A**2** are a length or width defined on the basis of one lateral side of the ceramic substrate.

FIG. **8** is a side sectional view showing a light emitting device package according to the fifth embodiment, FIG. **9** is a plan view showing a pattern formed on a top surface of a ceramic substrate shown in FIG. **8**, and FIG. **10** is a bottom view showing a pattern formed on a lower surface of the ceramic substrate shown in FIG. **8**. The following description of the fifth embodiment will be made with reference to the first embodiment.

Referring to FIGS. **8** to **10**, a first electrode pattern **111**, a second electrode pattern **113** and a first heat radiation pattern **115** are formed on the top surface of the ceramic substrate **110**, and a third electrode pattern **121**, a fourth electrode pattern **123** and a second heat radiation pattern **125** are formed on the lower surface of the ceramic substrate **110**. A plurality of conductive vias **131**, **133** and **135** are formed in the ceramic substrate **110**.

The first heat radiation pattern **115** is disposed between the first electrode pattern **111** and the second electrode pattern **113**, and the second heat radiation pattern **125** is disposed between the third electrode pattern **121** and the fourth electrode pattern **123**.

The light emitting device **140**B is attached onto the first heat radiation pattern **115** and the light emitting device **140** is connected to the first and second electrode patterns **111** and **114** through a wire **142**.

The first electrode pattern **111** is opposite to the third electrode pattern **121** and connected to the third electrode pattern **121** through the first conductive via **131**. The second electrode pattern **113** is opposite to the fourth electrode pattern **123** and connected to the fourth electrode pattern **123** through the second conductive via **133**. The first heat radiation pattern **115** is connected to the second heat radiation pattern **125** through the third conductive via **135**. A plurality of first to third conductive vias **131**, **133** and **135** are provided to improve the conductive efficiency, but the embodiment is not limited thereto.

Heat generated from the light emitting device **140** is transferred to the first and second heat radiation patterns **115** and **125** through the third conductive via **135** and then dissipated to the outside.

The first light-transmissive resin layer **150**, the phosphor layer **155** and the second light-transmissive resin layer **160** are formed on the ceramic substrate **110**.

The height of the phosphor layer **155** may be equal to or higher than the highest point of the wire **142** connected to the light emitting device **140**B based on the height T**1** of the wire **142**. If the wire **142** has the height T**1**, the wire **142** may not make contact with the second light-transmissive resin layer **160**, so that the particles of the phosphor material can be prevented from moving to the second light-transmissive resin layer **160** through the wire **142**.

FIGS. **11** and **12** are side views showing an external appearance of a package according to the embodiment. FIG. **11** is a side view obtained from the first direction Z of the package and FIG. **12** is a side view obtained from the second direction X of the package, which is rotated by the right angle from the first direction X.

Referring to FIG. **11**, when viewed in the first direction Z of the light emitting device package **101**, the light emitting device **140**A is biased to one side in the extension line of the second direction X (L1<L2). For instance, the light emitting device package **101** is located at the left region of the ceramic substrate **110**, so other patterns or a protective device can be additionally formed at the right region of the ceramic substrate **110**.

Thus, the lens unit **162** of the resin layer **170** formed on the light emitting device **140**A is disposed at one region in the first direction Z, so the light may be mainly distributed over the one region. The resin layer **170** can be formed by sequentially stacking the first light-transmissive resin layer **150**, the phosphor layer **155** and the second light-transmissive resin layer **160**.

FIG. **12** shows the package, which is rotated by the right angle from FIG. **11**, in the second direction X perpendicular to the first direction Z. When viewed in the second direction X, the light emitting device **140**A is located at the center of the extension line in the first direction Z. Thus, the lens unit **162** of the resin layer **170** is located at the center of the package.

Although the width of the ceramic substrate **110** in the first direction Z is the same width that of the ceramic substrate **110** in the second direction X in FIGS. **11** and **12**, the width of the ceramic substrate **110** in the first direction Z may be different from the width of the ceramic substrate **110** in the second direction X, and the embodiment is not limited thereto.

FIG. **13** is a view showing a display device according to the sixth embodiment. The package shown in FIG. **13** is same with the package shown in FIGS. **11** and **12**.

Referring to FIG. **13**, the display device **10** includes a bottom cover **11**, a module substrate **12** on which a plurality of light emitting device packages **101** are arrayed, an optical member **15** and a display panel **16**.

The module substrate **12** and the light emitting device packages **101** may constitute a light emitting module and the bottom cover **11**, at least one light emitting module and the optical member **15** may constitute a light unit.

The light emitting device packages **101** are arrayed on the module substrate **12** such that lens units of the resin layers **170** are spaced apart from each other at a regular interval, so that the light can be emitted over the whole area with a uniform brightness distribution. That is, the light emitting device packages **101** as shown in FIG. **12** are arrayed on the module substrate **12**.



The bottom cover **11** includes a same material with a material of a chassis or a mold frame, and the module substrate **12** is received in the bottom cover **11**.

The light emitting device packages **101** are arrayed on the module substrate **12**. In detail, the light emitting device packages **101** are solder-bonded to the module substrate **12**. A circuit pattern is formed on the module substrate **12** and the ceramic substrate **110** is mounted on the module substrate **12** such that the light emitting device packages **101** can be selectively connected to each other.

The light emitting device package **101** outputs the light emitted from the light emitting device as well as the light emitted from the phosphor material of the phosphor layer. The lights are mixed with each other into a target light and the target light is irradiated through the optical member **15** and the display panel **16**.

The optical member **15** may include at least one of a light guide plate, a diffusion sheet, a horizontal/vertical prism sheet, and a brightness enhancement film. The light guide plate may include a PC material or a PMMA (poly methyl methacrylate) material. Such a light guide plate may be omitted. The diffusion sheet diffuses the incident light, the horizontal/vertical prism sheet concentrates the incident light onto the display region, and the brightness enhancement sheet improves the brightness of light by reusing the wasted light.

The display panel **16** is disposed on the optical member **15**. For instance, the display panel **16** may be an LCD panel including first and second transparent substrates and a liquid crystal layer interposed between the first and second substrates. A polarizing plate can be attached to at least one surface of the display panel **16**, but the embodiment is not limited thereto. The display panel **16** displays information by using the light passing through the optical member **15**.

Such a display device **10** can be applied to a portable terminal, a monitor of a notebook computer or a laptop computer, and a television.

FIG. **14** is a view showing another example of the display device shown in FIG. **13**, in which the arrangement of the light emitting device package is modified.

Referring to FIG. **14**, the display device **10**A includes a module substrate **12** and light emitting device packages **101** arrayed on the module substrate **12**, which are arranged differently from the light emitting device packages **101** shown in FIG. **13**.

A lens unit of the light emitting device package **101** disposed at the center region C**0** is aligned in the same direction with the lens unit shown in FIG. **12**, and the remaining lens units of the light emitting device packages **101** are aligned in the direction as shown in FIG. **11**. Thus, the interval between the lens units of the light emitting device packages **101** may be increased at the center region C**0**. In detail, the interval D**1** between the center lens unit and the lens unit adjacent to the center lens unit may be larger than the interval D**1** between two other lens units. Thus, the embodiment can represent various light distributions using one type of package by utilizing the feature of the light emitting device and the lens unit, which are biased in one direction on the package as shown in FIGS. **11** and **12**. The lens unit is formed on the light emitting device as shown in FIGS. **12** and **13**.

Meanwhile, the light can be supplied to at least one lateral side of the light guide plate in the side-view scheme by vertically erecting the module substrate **12**. In detail, the module substrate can be disposed corresponding to one lateral side, both lateral sides or two adjacent lateral sides of the light guide plate, but the embodiment is not limited thereto. A reflective plate is disposed below the light guide plate and the optical sheet is disposed above the light guide plate, but the embodiment is not limited thereto.

Hereinafter, the embodiment will be described with reference to accompanying drawings. FIG. **15** is a side sectional view of the light emitting device package, FIG. **16** is a plan view showing a pattern formed on a top surface of the ceramic substrate shown in FIG. **15**, and FIG. **17** is a bottom view of the ceramic substrate shown in FIG. **15**.

Referring to FIGS. **15** to **17**, the light emitting device package **200** includes a substrate **210**, first and second electrode patterns **211** and **213**, third and fourth electrode patterns **221** and **223**, a heat radiation pattern **225**, conductive vias **231**, **233** and **235**, a light emitting device **240**, a first light-transmissive resin layer **250**, a phosphor layer **255**, a second light-transmissive resin layer **260**, and a moisture barrier layer **270**.

The substrate **210** has a superior heat-resistant property and a superior tarnish-resistant property against heat. The substrate **210** may include alumina, quartz, calcium zirconate, forsterite, SiC, graphite, fused silica, mullite, cordierite, zirconia, beryllia, aluminum nitride, or LTCC (low temperature co-fired ceramic). For the purpose of convenience of explanation, the planar type ceramic substrate will be described below as an example of the substrate **210**.

The ceramic substrate **210** may be prepared as a single-layer substrate or a multiple-layer substrate by using the structure of a single-side copper foil layer or a dual-side copper foil layer. The copper foil layer may be prepared as a metal plate by selectively using a conductive metal, such as Cu, Ag, Al, Ni, or Au and may have a predetermined pattern formed through an etching process. The ceramic substrate **210** may have a circular shape or a polygonal shape, but the embodiment is not limited thereto.

Referring to FIGS. **16** and **17**, the first and second electrode patterns **211** and **213** are formed on a top surface **210**A of the ceramic substrate **210**, and the third and fourth electrode patterns **221** and **223** and the heat radiation pattern **225** are formed on a lower surface **210**B of the ceramic substrate **210**. The first electrode pattern **211** is connected to the third electrode pattern **221** through at least one conductive via **231** such that a part of the first electrode pattern **211** may correspond to a part of the third electrode pattern **221**. In addition, the second electrode pattern **213** is connected to the fourth electrode pattern **223** through at least one conductive via **233** such that a part of the second electrode pattern **213** may correspond to a part of the fourth electrode pattern **223**.

A size of the first electrode pattern **211** may be larger than that of the second electrode pattern **213** and the first electrode pattern **211** may branch in various directions to dissipate heat generated from the light emitting device **240**.

The heat radiation pattern **225** may be formed on the lower surface **210**B of the ceramic substrate **210** corresponding to the first electrode pattern **211**. The first electrode pattern **211** is connected to the heat radiation pattern **225** through at least one third conductive via **235** such that a part of the first electrode pattern **211** may correspond to a part of the heat radiation pattern **225**. The heat radiation pattern **225** may have a size larger than that of the third and fourth electrode patterns **221** and **223**.

The light emitting device **240** is formed on the first electrode pattern **211**. In detail, the light emitting device **240** is mounted on the first electrode pattern **211** by using a conductive adhesive or a die bonding.

The second electrode pattern **213** is spaced apart from the first electrode pattern **211** and connected to the light emitting device **240** through a wire **242**.



The first and second electrode patterns **211** and **213** are positioned corresponding to the center region of the ceramic substrate **210** and electrically connected to the light emitting device **240**. A part of the first electrode pattern **211** may correspond to a part of the second electrode pattern **213** at the other region and a protective device, such as the Zener diode or the TVS (transient voltage suppression), may be electrically connected to the first and second electrode patterns **211** and **213**.

The light emitting device **240** can be connected to the first and second electrode patterns **211** and **213** through a die bonding scheme, a flip chip bonding scheme or a wire bonding scheme according to the position of an electrode of a chip or a type of the chip.

As shown in FIGS. **15** to **17**, the first to third conductive vias **231**, **233** and **235** are formed through the ceramic substrate **210** such that the patterns formed on the ceramic substrate **210** can be connected to the patterns formed under the ceramic substrate **210**. The first to third conductive vias **231**, **233** and **235** of the ceramic substrate **210** can be formed by filling via holes or through holes with conductive materials, such as Ag, or coating the conductive materials around the via holes or through holes. The third electrode pattern **221** can be integrally formed with the heat radiation pattern **225**. Such a configuration of the patterns may vary depending on the heat radiation efficiency.

The light emitting device **240** is an LED chip including a color LED chip, such as blue LED chip, a green LED chip, or a red LED chip, or a UV LED chip. At least one light emitting device **240** may be disposed on the ceramic substrate **210**.

Referring to FIG. **15**, a resin layer may be formed on the ceramic substrate **210**. The resin layer is an encapsulant layer to cover the light emitting device **240** and may include a phosphor material. For instance, the resin layer may include the first light-transmissive resin layer **250**, the phosphor layer **255** and the second light-transmissive resin layer **260**.

The first light-transmissive resin layer **250** is formed on the ceramic substrate **210**, and the phosphor layer **255** is formed on the first light-transmissive resin layer **250**. The second light-transmissive resin layer **260** is formed on the phosphor layer **255**. The first light-transmissive resin layer **250**, the phosphor layer **255** and the second light-transmissive resin layer **260** may include a resin material, such as silicon, epoxy, or hybrid resin, but the embodiment is not limited thereto.

The first light-transmissive resin layer **250** encapsulants the light emitting device **240** and the first and second electrode patterns **211** and **213**. The first light-transmissive resin layer **250** may have a predetermined thickness larger than a thickness of the light emitting device **240**. The first light-transmissive resin layer **250** may be uniformly formed on the ceramic substrate **210** or may be unevenly formed on the ceramic substrate **210** according to the configuration of the structure.

The phosphor layer **255** may be formed on the first light-transmissive resin layer **250** through a molding process or a coating process. The phosphor layer **255** may include at least one type of phosphor materials, but the embodiment is not limited thereto. The phosphor layer **255** can be formed over the whole area of the first light-transmissive resin layer **250** with a predetermined thickness.

The second light-transmissive resin layer **260** may be formed on the phosphor layer **255**. For instance, the second light-transmissive resin layer **260** can be formed through the injection molding process. The second light-transmissive resin layer **260** includes a lens unit **262**. The lens unit **262** has a convex lens shape and protrudes upward of the light emitting device **240**. The lens unit may be omitted.

Other regions of the second light-transmissive resin layer **260** except for the lens unit **262** are flat, so the second light-transmissive resin layer **260** can be formed on the phosphor layer **255** with a uniform thickness.

Referring to FIGS. **15** and **16**, the distance L**5** between the center and the outer portion of the lens unit **262** corresponds to the radius of a lower circle **262**A and has a size of about 600 μm or more. The distance L**5** may vary depending on the chip size. An area of the electrode patterns **211** and **213** in the lower circle **262**A may be 70% or above, so the light reflection efficiency can be improved.

The moisture barrier layer **270** is formed at an outer portion of the ceramic substrate **210** by using spray equipment or sputtering equipment.

The moisture barrier layer **270** prevents the moisture from penetrating into the interfacial surfaces between the ceramic substrate **210** and the resin layers **250**, **255** and **260**.

The moisture barrier layer **270** may be formed on at least one side or the entire surface of the ceramic substrate **210** and outer portions of the resin layers **250**, **255** and **260**.

The moisture barrier layer **270** may include a same material with a material of the resin layers **250**, **255** and **260** or the ceramic substrate **210**. For instance, the moisture barrier layer **270** may include one selected from the group consisting of silicon, epoxy, sapphire, and nitride aluminum. In this case, the adhesive strength between the moisture barrier layer **270** and the resin layers **250**, **255** and **260** or between the moisture barrier layer **270** and the ceramic substrate **210** may be reinforced and the thermal deformation can be reduced.

The moisture barrier layer **270** can be formed along an outer contour profile of the ceramic substrate **210** and the resin layers **250**, **255** and **260**. For instance, the moisture barrier layer **270** may have an irregular concavo-convex shape. In this case, the adhesive strength may be increased at the contact surface between the moisture barrier layer **270** and the resin layers **250**, **255** and **260** or between the moisture barrier layer **270** and the ceramic substrate **210** and the travelling direction of the light can be changed at the outside of the resin layers **250**, **255** and **260**.

FIGS. **18** to **21** are sectional views showing the procedure for manufacturing the light emitting device package.

Referring to FIG. **18**, the first and second electrode patterns **211** and **213** are formed on the ceramic substrate **210** and the third and fourth electrode patterns **221** and **223** and the heat radiation pattern **225** are formed under the ceramic substrate **210**. As shown in FIGS. **16** and **17**, the first electrode pattern **211** is connected to the third electrode pattern **221** (see, FIG. **17**) and the heat radiation pattern **225** through the first and third conductive vias **231** and **235**, respectively, and the second electrode pattern **213** is connected to the fourth electrode pattern **223** through the second conductive via **233**.

The light emitting device **240** is disposed on the first electrode pattern **211**. The light emitting device **240** is electrically connected to the first electrode pattern **211** through the die bonding scheme, and connected to the second electrode pattern **213** through a wire. The light emitting device **240** can be electrically connected to the first and second electrode patterns **211** and **213** through one wire, plural wires, a flip bonding scheme or the die bonding scheme according to the type of the chip or the mounting scheme for the light emitting device **240**. The light emitting device **240** is an LED chip including a color LED chip, such as blue LED chip, a green LED chip, or a red LED chip, or a UV LED chip, but the embodiment is not limited thereto.

One or plural light emitting devices **240** can be installed in each package unit (2P) and a plurality of LED chips are connected to each other in series or parallel.



The light emitting device **240** is disposed on the first electrode pattern **211** formed on the top surface of the ceramic substrate **210**, so the first electrode pattern **211** may have a relatively large area to effectively reflect the light and dissipate the heat. In addition, a photo solder resistor (PSR) is coated on the top surface of the ceramic substrate **210** except for the region of the first and second electrode patterns **211** and **213** to improve the reflectivity of the light.

Referring to FIGS. **18** and **19**, the resin layers **250**, **255** and **260** may be formed on the ceramic substrate **210** and the resin layers **250**, **255** and **260** may include phosphor materials. According to the embodiment, the first light-transmissive resin layer **250**, the phosphor layer **255** and the second light-transmissive resin layer **260** are formed on the ceramic substrate **210** and the resin layers **250**, **255** and **260** may include a resin material, such as silicon, epoxy, or hybrid resin, but the embodiment is not limited thereto.

The first light-transmissive resin layer **250**, the phosphor layer **255** and the second light-transmissive resin layer **260** may have the same refractive index. Otherwise, the first light-transmissive resin layer **250**, the phosphor layer **255** and the second light-transmissive resin layer **260** may include materials having refractive indexes which are gradually lowered. The materials for the resin layers **250**, **255** and **260** have the refractive index in the range of 1 to 2.

The first light-transmissive resin layer **250** may have the uniform thickness or the variable thickness depending on the regions thereof. The first light-transmissive resin layer **250** may have the injection-molded structure and may have an irregular shape due to the structural shape of the top surface of the ceramic substrate **210**. The wire connected to the light emitting device **240** is disposed below the first light-transmissive resin layer **250** and a part of the wire may be disposed on the first light-transmissive resin layer **250**, but the embodiment is not limited thereto.

The phosphor layer **255** can be prepared by adding a phosphor material to a resin material and coated on the first light-transmissive resin layer **250** with a uniform thickness, but the embodiment is not limited thereto. The phosphor layer **255** can be formed over the whole top surface of the first light-transmissive resin layer **250**.

The phosphor material added to the phosphor layer **255** may include at least one of the blue phosphor material, the green phosphor material, the yellow phosphor material and the red phosphor material, but the embodiment is not limited thereto.

The second light-transmissive resin layer **260** can be formed on the phosphor layer **255** through the injection molding process. The second light-transmissive resin layer **260** includes the lens unit **262** formed on the light emitting device **240**. The lens unit **262** includes a convex lens formed on the light emitting device **240**.

The distance L**5** between the center and the outer portion of the lens unit **262** corresponds to the radius of a largest circle in the lens unit **262** and has a size of about 600 μm or more.

The second light-transmissive resin layer **260** is disposed on the phosphor layer **255**. Other regions of the second light-transmissive resin layer **260** except for the lens unit **262** may have a planar shape or a concavo-convex shape.

Referring to FIGS. **19** and **20**, when the second light-transmissive resin layer **260** has been formed, the ceramic substrate **210** is divided into a package unit. For instance, the dicing process using a blade can be employed to divide the ceramic substrate **210** into the package unit. In addition, the ceramic substrate **210** can be divided into the package unit through the breaking process, in which a groove (for instance, a V-groove) is formed in a package boundary of the ceramic substrate **210** to divide the ceramic substrate **210**. As a result, the light emitting device package shown in FIG. **20** can be obtained. The ceramic substrate **210** may have a circular shape or a polygonal shape, but the embodiment is not limited thereto.

A gap may be formed between the ceramic substrate **210** and the resin layers. In detail, the gap may be formed at an interfacial surface **205** between the ceramic substrate **210** and the first light-transmissive resin layer **250** due to the above dicing process or the breaking process and moisture may penetrate into the gap. The moisture may oxidize the electrode patterns **211** and **213** and cause electric short between the electrode patterns **211** and **213**, thereby shortening the life span of the light emitting device **240**.

Referring to FIGS. **20** and **21**, the moisture barrier layer **270** is formed at an outer portion of the ceramic substrate **210**. The moisture barrier layer **270** may include silicon, epoxy, alumina, or nitride alumina. In order to improve the adhesive strength with respect to the resin layers **250**, **255** and **260** or the ceramic substrate **210**, the moisture barrier layer **270** may include the material the same as that of the resin layers **250**, **255** and **260** or the ceramic substrate **210**.

The moisture barrier layer **270** may be formed on at least one side or the entire surface of the ceramic substrate **210** and outer portions of the resin layers **250**, **255** and **260**. The embodiment does not limit the thickness of the moisture barrier layer **270**.

The moisture barrier layer **270** can be formed along an outer contour profile of the ceramic substrate **210** and the resin layers. For instance, the moisture barrier layer **270** may have an irregular concavo-convex shape.

The light emitting device package can emit the light having a color, such as white, red, green or blue. In addition, the light emitting device package including the ceramic substrate **210** may represent the superior property against the moisture.

FIG. **22** is a side sectional view showing a light emitting device package according to the eighth embodiment. The following description of the eighth embodiment will be made with reference to the seventh embodiment.

Referring to FIG. **22**, the light emitting device package **200**A is bonded to the first and second electrode patterns **211** and **213** of the ceramic substrate **210** through the flip scheme. The protective device, such as a Zener diode or the TVS (transient voltage suppression) diode, may be bonded to the first and second electrode patterns **211** and **213** through the flip scheme.

A phosphor layer **255**A is formed on the ceramic substrate **210**. The phosphor layer **255**A may be formed on the light emitting device **240** or on the region covering the first and second electrode patterns **211** and **213**. In addition, phosphor layer **255**A can be formed at an outer portion of the ceramic substrate **210** such that the phosphor layer **255**A may not be exposed.

The second light-transmissive resin layer **260** is formed on the phosphor layer **255**A. The second light-transmissive resin layer **260** includes the lens unit **262** protruding upward of the light emitting device **240**. The second light-transmissive resin layer **260** makes contact with the phosphor layer **255**A and an outer portion of the top surface of the ceramic substrate **210** to surround the whole surface of the phosphor layer **255**A.

The moisture barrier layer **270** is formed between the ceramic substrate **210** and the outer surface of the second light-transmissive resin layer **260**. In detail, the moisture barrier layer **270** is formed at the interfacial surface between the ceramic substrate **210** and the second light-transmissive resin layer **260**. Thus, the moisture is prevented from penetrating into the gap between the ceramic substrate **210** and the second light-transmissive resin layer **260**.

FIG. **23** is a side sectional view showing a light emitting device package according to the ninth embodiment. The following description of the ninth embodiment will be made with reference to the seventh embodiment.

Referring to FIG. **23**, the first electrode pattern **311**, the second electrode pattern **313** and the first heat radiation pattern **315** are formed on the top surface of the ceramic substrate **310**, and the third electrode pattern **321**, the fourth electrode pattern **323** and the second heat radiation pattern **325** are formed on the lower surface of the ceramic substrate **310**. A plurality of conductive vias **331**, **333** and **335** are formed in the ceramic substrate **310**.

The first heat radiation pattern **315** is disposed between the first electrode pattern **311** and the second electrode pattern **313** and the second heat radiation pattern **325** is disposed between the third electrode pattern **321** and the fourth electrode pattern **323**.

The light emitting device **340** is attached onto the first heat radiation pattern **315** and the light emitting device **340** is connected to the first and second electrode patterns **311** and **313** through the wire **342**.

The first electrode pattern **311** is opposite to the third electrode pattern **321** and connected to the third electrode pattern **321** through the first conductive via **331**. The second electrode pattern **313** is opposite to the fourth electrode pattern **323** and connected to the fourth electrode pattern **323** through the second conductive via **333**. The first heat radiation pattern **315** is connected to the second heat radiation pattern **325** through the third conductive via **335**. A plurality of first to third conductive vias **331**, **333** and **335** are provided to improve the conductive efficiency, but the embodiment is not limited thereto.

Heat generated from the light emitting device **340** is transferred to the first and second heat radiation patterns **315** and **325** through the third conductive via **335** and then dissipated to the outside.

The first light-transmissive resin layer **350**, the phosphor layer **355** and the second light-transmissive resin layer **360** are formed on the ceramic substrate **310**. In detail, the resin layers **350**, **355** and **360** are formed on an inner portion of the top surface of the ceramic substrate **310**. An outer portion of the top surface of the ceramic substrate **310** is exposed because there are no resin layers **350**, **355** and **360**. Thus, the moisture barrier layer **370** is formed at an outer portion of the ceramic substrate **310**, the outer portion of the top surface of the ceramic substrate **310**, and an outer portion of the resin layers **350**, **355** and **360**. The moisture barrier layer **370** is formed along the contour profile of the light emitting device package **300**. For instance, the moisture barrier layer **370** may have the stepped structure. Since the moisture barrier layer **370** is formed at the outer portion of the ceramic substrate **310**, a contact area between the moisture barrier layer **370** and the top surface of the ceramic substrate **310** may be enlarged, so that the moisture is prevented from penetrating into the gap between the ceramic substrate **310** and the resin layers. The moisture barrier layer **370** is formed of a same material that of the resin layer **350**, **355** and **360** or the ceramic substrate **310** and the resin layer **350**, **355** and **360** has a width equal to or less that of the ceramic substrate **310**.

The light emitting device package according to the embodiments can be used as the light source for the indicator, the lighting device and the display device. In addition, one embodiment may be selectively applicable to other embodiments. The light emitting device package according to the embodiments can be used for the light unit having the structure provided with a plurality of light emitting device packages. The light unit may be applicable to a lighting lamp, a signal lamp, a headlight of a vehicle, and an electric signboard.

FIG. **24** is a view showing a display device according to the embodiment. The package shown in FIG. **24** is same with the package described above.

Referring to FIG. **24**, the display device **400** includes a bottom cover **401**, a module substrate **410** on which a plurality of light emitting device packages **200** are arrayed, an optical member **50** and a display panel **460**.

The module substrate **410** and the light emitting device packages **200** may constitute a light emitting module and the bottom cover **401**, at least one light emitting module and the optical member **450** may constitute a light unit.

The light emitting device packages **200** are arrayed on the module substrate **410** such that lens units of the resin layers **260** are spaced apart from each other at a regular interval, so that the light can be emitted over the whole area with a uniform brightness distribution. That is, the light emitting device packages **200** as shown in FIG. **15** are arrayed on the module substrate **410**.

The bottom cover **401** includes a same material with a material of a chassis or a mold frame, and the module substrate **410** is received in the bottom cover **401**.

The light emitting device packages **200** are arrayed on the module substrate **410**. In detail, the light emitting device packages **200** are solder-bonded to the module substrate **410**. A circuit pattern is formed on the module substrate **410** and the ceramic substrate **210** is mounted on the module substrate **410** such that the light emitting device packages **200** can be selectively connected to each other.

The light emitting device package **200** outputs the light emitted from the light emitting device as well as the light emitted from the phosphor material of the phosphor layer. The lights are mixed with each other into a target light and the target light is irradiated through the optical member **450** and the display panel **460**.

The optical member **450** may include at least one of a light guide plate, a diffusion sheet, a horizontal/vertical prism sheet, and a brightness enhancement film. The light guide plate may include a PC material or a PMMA (poly methyl methacrylate) material. Such a light guide plate may be omitted. The diffusion sheet diffuses the incident light, the horizontal/vertical prism sheet concentrates the incident light onto the display region, and the brightness enhancement sheet improves the brightness of light by reusing the wasted light.

The display panel **460** is disposed on the optical member **450**. For instance, the display panel **460** may be an LCD panel including first and second transparent substrates and a liquid crystal layer interposed between the first and second substrates. A polarizing plate can be attached to at least one surface of the display panel **460**, but the embodiment is not limited thereto. The display panel **460** displays information by using the light passing through the optical member **450**.

Such a display device **400** can be applied to a portable terminal, a monitor of a notebook computer or a laptop computer, and a television.

A method of manufacturing a light emitting device package according to the embodiment includes the steps of mounting a light emitting device on a ceramic substrate; forming a resin layer on the ceramic substrate to seal the light emitting device; dividing the ceramic substrate into package units; and forming a moisture barrier layer at an interfacial surface between the divided ceramic substrate and the resin layer.

The embodiment can prevent moisture from penetrating into the package employing the ceramic substrate. The embodiment can provide the light emitting device package capable of effectively dissipating heat generated from the light emitting device. The embodiment can improve the reliability of the light emitting device package. The embodiment can provide the light emitting device package employing a planar type ceramic substrate. The embodiment can improve the light distribution by disposing the light-transmissive resin layer between the phosphor layer and the light emitting device such that the phosphor layer can be spaced apart from the light emitting device. The embodiment can effectively dissipate heat generated from the light emitting device by using the ceramic substrate.

Any reference in this specification to "one embodiment," "an embodiment," "example embodiment," etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is submitted that it is within the purview of one skilled in the art to effect such feature, structure, or characteristic in connection with other ones of the embodiments.

Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

What is claimed is:

**1**. A light emitting device package comprising:

a ceramic substrate;

a semiconductor light emitting device disposed on a top surface of the ceramic substrate;

a first light-transmissive resin layer disposed on the top surface of the ceramic substrate and a top surface of the semiconductor light emitting device to cover the semiconductor light emitting device;

a second light-transmissive resin layer disposed on a top surface of the first light-transmissive resin layer; and

a phosphor layer including a phosphor material between the top surface of the first light-transmissive resin layer and a lower surface of the second light-transmissive resin layer,

wherein the first light-transmissive resin layer has a same width as a width of the ceramic substrate,

wherein the first and second light-transmissive resin layers include a convex portion protruding upward of the semiconductor light emitting device,

wherein the first light-transmissive resin layer physically contacts a surface of the semiconductor light emitting device,

wherein the lower surface of the second light-transmissive resin layer physically contacts a top surface of the phosphor layer,

wherein the first light-transmissive resin layer includes a planar top surface substantially parallel to the top surface of the ceramic substrate on a periphery of the convex portion of the first light-transmissive resin layer,

wherein the second light-transmissive resin layer includes a planar top surface substantially parallel to the top surface of the ceramic substrate on a periphery of the convex portion of the second light-transmissive resin layer, wherein a lower surface of the phosphor layer is spaced apart from the top surface of the ceramic substrate, and

wherein the first and second light-transmissive resin layers do not contain any phosphor material.

**2**. The light emitting device package of claim **1**, further comprising:

first and second electrode patterns electrically connected to the semiconductor light emitting device and disposed on the ceramic substrate;

third and fourth electrode patterns under the ceramic substrate; and

a plurality of first and second conductive vias to connect the first and second electrode patterns with the third and fourth electrode patterns according to polarity of the first to fourth electrode patterns.

**3**. The light emitting device package of claim **2**, further comprising:

a heat radiation pattern disposed under a lower surface of the ceramic substrate and physically contacting the lower surface of the ceramic substrate; and

a third conductive via physically contacting the heat radiation pattern and the first electrode pattern.

**4**. The light emitting device package of claim **3**, wherein the semiconductor light emitting device is disposed on the first electrode pattern and physically contacts the heat radiation pattern.

**5**. The light emitting device package of claim **2**, further comprising:

a first heat radiation pattern on the substrate and spaced apart from the first and second electrode patterns;

a second heat radiation pattern under a lower surface of the substrate; and

a fourth conductive via physically contacting the first and second heat radiation patterns,

wherein the semiconductor light emitting device is disposed on the first heat radiation pattern.

**6**. The light emitting device package of claim **1**, wherein the planar top surface of the first light-transmissive resin layer overlaps the lower surface of the phosphor layer in a vertical direction.

**7**. A light emitting device package comprising:

a substrate;

a semiconductor light emitting device on the substrate;

a plurality of resin layers disposed on a top surface of the substrate and the semiconductor light emitting device; and

a moisture barrier layer physically contacting a vertical sidewall of the substrate and a sidewall of the plurality of resin layers,

wherein the plurality of resin layers overlaps the semiconductor light emitting device,

wherein the moisture barrier layer is directly disposed on a boundary between the sidewall of the substrate and at least one of the plurality of resin layers adjacent to the substrate, and

wherein a portion of the moisture barrier layer is located at a lower position than the top surface of the substrate and does not overlap the substrate in a vertical direction.

**8**. The light emitting device package of claim **7**, wherein the moisture barrier layer is formed of a same material as a material of the plurality of resin layers or the substrate.

**9**. The light emitting device package of claim **7**, wherein the plurality of resin layers has a width equal to or less than a width of the substrate and sidewalls of the substrate are disposed at an outer portion than that of the plurality of resin layers, and

wherein the moisture barrier layer physically contacts the top surface of the substrate.

**10**. The light emitting device package of claim **7**, further comprising:

first and second electrode patterns electrically connected to the semiconductor light emitting device and disposed on the substrate;

third and fourth electrode patterns under the substrate; and

a plurality of first and second conductive vias to connect the first and second electrode patterns with the third and fourth electrode patterns according to polarity of the first to fourth electrode patterns;

a heat radiation pattern under a lower surface of the substrate; and

a third conductive via physically contacting the heat radiation pattern and the first electrode pattern.

**11**. The light emitting device package of claim **10**, wherein the substrate is a ceramic substrate and the semiconductor light emitting device is formed on the first electrode pattern physically contacting the heat radiation pattern.

**12**. The light emitting device package of claim **11**, wherein the substrate has a planar top surface, and

wherein at least one of the plurality of resin layers includes a planar top surface on a periphery region adjacent the sidewall of the substrate.

**13**. The light emitting device package of claim **7**, wherein the moisture barrier layer is disposed on a whole sidewall of one of the plurality of resin layers.

**14**. The light emitting device package of claim **7**, wherein the moisture barrier layer includes at least one of alumina, aluminum nitride, silicon, epoxy and hybrid resin.

**15**. The light emitting device package of claim **7**, wherein the plurality of resin layers includes:

a first light-transmissive layer disposed on the top surface of the substrate;

a phosphor layer disposed on a top surface the first light-transmissive resin layer; and

a second light-transmissive resin layer having a lens unit disposed on a top surface of the phosphor layer, and

wherein the phosphor layer physically contacts the first light-transmissive resin layer and the second light-transmissive resin layer.

**16**. The light emitting device package of claim **15**, wherein the first light-transmissive resin layer, the phosphor layer, and the second light-transmissive resin layer each have a width equal to or larger than a width of the substrate.

**17**. The light emitting device package of claim **15**, wherein the first and second light-transmissive resin layers include a convex portion protruding upward of the semiconductor light emitting device, and

wherein the first light-transmissive resin layer includes a planar top surface substantially parallel to the top surface of the ceramic substrate on a periphery of the convex portion.

**18**. The light emitting device package of claim **15**, wherein the first and second light-transmissive resin layers do not contain any phosphor material.

**19**. The light emitting device package of claim **18**, wherein the phosphor layer is spaced apart from the top surface of the substrate.

**20**. The light emitting device package of claim **7**, wherein the moisture barrier layer directly contacts a boundary between lateral surfaces of the plurality of resin layers.

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